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Frontispiece
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FRANCESCO REDI
[1626 - 1697]

[From Crooke: A Description of the Body of Man. London, 1631.]

ANNALS OF MEDICAL HISTORY
Volume VIII Winter, 1926 Number 4

SOME WORTHIES OF THE CAMBRIDGE MEDICAL SCHOOL*

By SIR HUMPHRY ROLLESTON, BART., K.C.B., M.D., F.R.C.P.

CAMBRIDGE, ENGLAND

MANY might be regarded as "Worthies of the Cambridge Medical School"; thus of the eighty presidents of the Royal College of Physicians of London since 1518 there have been thirty-seven with Cambridge medical degrees (St. John's 7, Caius 6, Peterhouse, Trinity, and Queen's 3 each); but it is of course to those who were resident members of the University that the title more especially refers.

John Caius (1510–1573)

The name Kay or Kaye was, after the fashion of the day, transliterated into the Latin equivalent, Caius. Educated at Gonville Hall, Cambridge, of which society he became a Fellow (1533), he then went to Padua and learned anatomy from Montanus and Vesalius, becoming Doctor of Medicine (1541) and lecturer on Greek at that University. After returning to England in 1544 and practicing in Cambridge, Norwich and Shrewsbury, he published in 1552 the first monograph on a single disease in this country and in the vulgar tongue, "A Boke or Counseill against the Sweate or Sweating Sicknesse," which he subsequently expanded and translated into Latin, "De Ephemerâ Britannicâ," thus no doubt conforming to the professional etiquette of the day. He was, in brief, the founder of scientific anatomy in this country and a Grecian after the order of Linacre. Like Linacre, too, he was physician to three sovereigns, Edward vi, Mary and Elizabeth, and president of the College of Physicians 1555–1560, and 1562, 1563, 1571, nine years in all. He did much for the College, founding its Annals, designing the symbols and insignia by which the president should be duly honored, especially the "Staff of silver or caduceus with its head adorned with the arms of the College supported by four serpents to remind him by its material (silver) to govern with patience and courtesy, and by its symbols (serpents) with judgment and wisdom." The presence of four serpents is somewhat intriguing, for Aesculapius' wand had one only, and that of Mercury but two serpents.

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* An address given at the Royal Society of Medicine on May 3, 1926.

Caius' own coat of arms, as shown in Caius College, bears two green serpents standing on their tails on a green stone amid flowers of amaranth, signifying "wisdome stayeth upon virtue and adorned with immortality," a characteristic Elizabethan conceit. The grant of arms and a crest for the five regius professors of divinity, Hebrew, Greek, physic, and civil law, was obtained in 1590 by Dr. Thomas Lorkin, regius professor of physic, 1564–1591. It is gratifying to find that the average tenure of office of the eighteen professors from 1540 to 1925 is twenty-one years, and longer than that of the other regius professorships; R. Plumtre held it for fifty-two years, and Glisson for forty-one years. As a curious incident it may be noted that Caius contended in 1568 that Cambridge was an older university than Oxford, being founded by one Cantaber in 394 B.C.! Thus going much better than Sir Symonds D'Ewes who, speaking in the House of Commons in 1642, was content to take it for granted that no one would dispute that it was a nursery of learning in the time of Alfred the Great, and a renowned city five hundred years before there was a house at Oxford. The Oxford opponent of John Caius was curiously enough a man of like surname, Thomas Caius, Fellow of All Souls, but not a relative. John Caius had already in 1557 refounded Gonville Hall as Gonville and Caius College in the interests of medicine, adorning it with three gates, the first that of Humility, by which you enter, then the gate between two courts of the College, inscribed "Virtutis" in front and "Sapientiae" on the other side, and on the way from the College to the Senate House where degrees are conferred, the beautiful Gate of Honour. On January 24, 1558, he became Master, but with prophetic reluctance, for he was out of sympathy with the militant protestantism, not to say vandalism, of the time which led to wholesale destruction of works of art, missals, embroidered vestments, and articles of virtu. He did his best to stem this devastating tide by collecting them in his lodge, but this raised trouble; "the popishe trumpery" was thrown out of the window and burnt in the court under the direction of the vice-chancellor, Dr. Whitgift, Master of Trinity, whose protestant zeal secured him the archbishopric of Canterbury, and who, let us hope, tried to make amends for his ill deeds by founding the Whitgift Hospital at Croydon.

Caius was expelled from his own College, and as he had spent his all on it, ended his days in penury, exiled in London, on the day, July 29, 1573, that he had predicted. He was allowed to be buried in the grave he had had prepared in the College Chapel, which is inscribed: "Vivit post funera Virtus. Fui Caius."

As Sir St. Clair Thomson says, it is unthinkable that Shakespeare intended to portray in the figure of fun he dubbed Dr. Caius in "The Merry Wives of Windsor" the learned and dignified president of the College of Physicians, nor yet Sir Theodore Turquet de Mayerne, unless indeed we venture to convict Shakespeare of caricaturing this eminent supporter of antimony, and a really great man who first set the example of taking copious notes on clinical cases (N. Moore).

Francis Glisson (1597–1677)

Francis Glisson was a scholar, Fellow, lecturer on Greek (1625), and, though not in Holy Orders, dean (1629) of Caius College; then, possibly as the result of Harvey's discovery of the circulation (1628), he turned to the physic line, becoming M.D. in 1634, and regius professor of physic in 1636, a post which he held till his death. He was somewhat of an absentee, practicing for a time in Colchester, and was much in London; for being a pronounced Presbyterian he probably found the intensely Royalist atmosphere of the University distasteful. He did yeoman's service in the plague of London, 1665, was one of the Founders of the Royal Society of London, and like Caius was president of the Royal

College of Physicians of London (1667–1670). It may be noted here that of the eighteen regius professors since 1540 there have been seven Caians, and two of these have also been Masters of that College.

Glisson was a philosopher, a physiologist, a good morbid anatomist, clinician, and, as Muirhead Little has recently shown, an orthopedic surgeon. He described muscular irritability, proved that on contracting a muscle did not alter in bulk, and anticipated by almost a century modern teaching on muscular physiology in his "Tractatus de Natura Substantiae energeticae" (1672) and "De Ventriculo et Intestinis" (1677). His "Tractatus de Rachitide sive Morbo Puerili" (1650), in 416 pages, is, except for Caius' "On the Sweating Sickness," which is a slight work in comparison and lacking in the correlation of clinical manifestations with morbid changes shown in this treatise on rickets, the earliest monograph on a single disease published in this country. It is "one of the glories of English medicine," and was begun by a group of Fellows of the College in 1645, but the others dropped off, so that it was Glisson's work. This projected team work was no secret, and Daniel Whistler (President of the Royal College of Physicians, 1683) read as his *Disputatio Medica Inauguralis* at Leyden in 1645 "De Morbo puerili Anglorum

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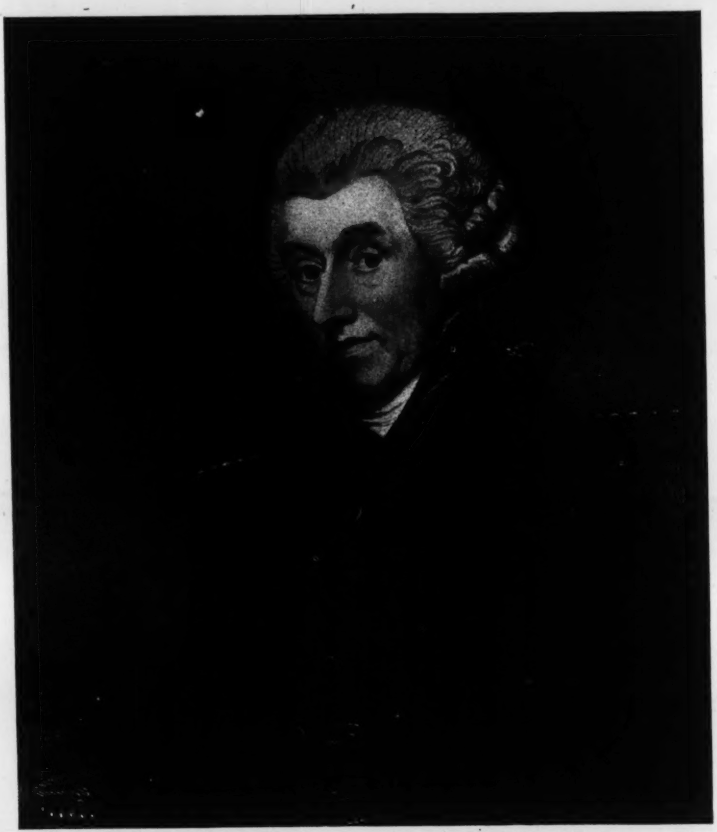
FRANCIS GLISSON, M.D., F.R.S., REGIUS PROFESSOR OF PHYSIC (1636–1677), PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON (1667–1670).

quem patrio idiomate indigenae vocant The Rickets." In this tract of eighteen pages no claim is made for the discovery of this disease but only for originating the truly formidable name "paedosteosplanchnocaces." It is supposed, and with fair reason, that though Whistler published the first book on rickets, he got wind of the then new idea. Comparatively little was added to the knowledge of rickets until this century with the advent of vitamins and the influence of sunlight. Glisson's famous "Anatomia Hepatis" (1654) has made his name and capsule familiar to generations of students. A keen clinician, his mental bent was directed even more to the elucidation of morbid changes and etiology. He died in his house in New Street, Shoe Lane, London, and was buried in his parish churchyard, St. Bride, Fleet Street.

WILLIAM HEBERDEN THE ELDER (1710–1801)

William Heberden the Elder was Fellow (1730–1752) and Linacre Lecturer at St. John's College, Cambridge (1734–1738) and practiced in Cambridge before he came to London in 1748. The friend and one of the medical attendants of Samuel Johnson, he was summoned, when the Great Cham was in distress, as "Ultimus Romanorum, the last of our learned physicians," and on another occasion reproached as "timidorum timidissimus" for not directing the surgeon to make deeper incisions into the edematous legs of the lexicographer. He gave the first and classical description of angina pectoris (1772). He took careful notes of his patients in the sick room, reading them over every month and then writing down in a kind of medical common-place book whatever he thought worthy of preservation; in this way



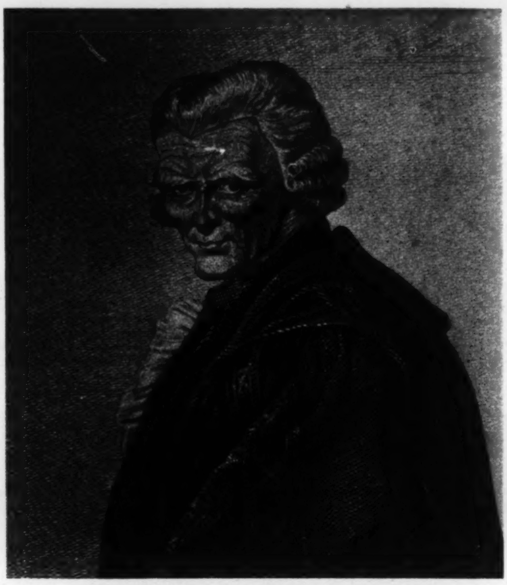
WILLIAM HEBERDEN, THE ELDER, M.D., F.R.S. (1710–1801).

he produced by the time he was seventy-two years of age his celebrated "Commentarii de Morborum Historiâ et Curatione," which he intrusted to his son William Heberden with the injunction that it was not to be published until after his death. This was the last important medical treatise written in Latin. One of the greatest of English clinicians, he lived to be ninety-one, and in his eighty-sixth year was painted by Sir William Beechey, R.A., who on arriving at Windsor for the purpose found he had forgotten his canvas and sent for a hard shirt on which he successfully depicted this "English Celsus," as Osler called him; at least this is how the story runs, but Dr. G. C. Peachey, with his stern love of historical truth, has collected opinions to show that the shirt incident is "extremely unlikely."

ROBERT GLYNN (1719–1800)

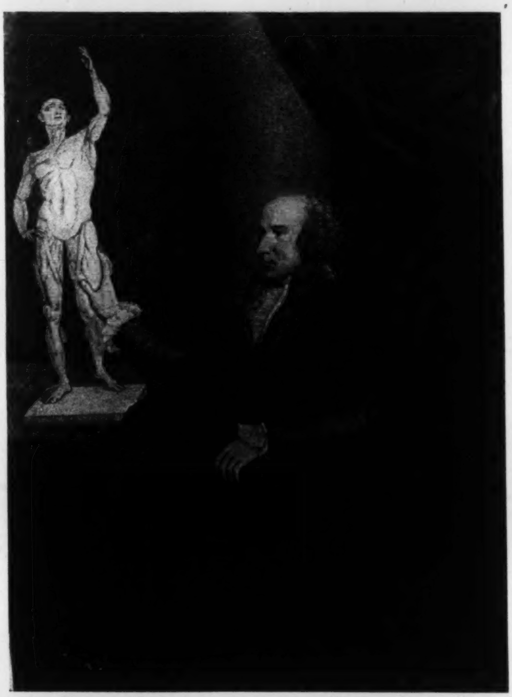
Robert Glynn, afterwards Clobery, born in Cornwall and educated at Eton and King's, was an eccentric physician, not only in refusing to take fees from Cornishmen and Etonians, but in other ways: in manner, in dress, and in directing that he should be buried by torch-light in King's Chapel between 10 and 11 P.M. Among other peculiarities he never prescribed either opium or mercury, as he was firmly of opinion that even syphilis might be cured without the aid of this last remedy. Being taken ill when at some distance from home, he sent for a neighboring physician, to whom he said: "I am going to be very ill, and commit myself to your care; but on no account give me any of that vile drug, opium, or any preparation of it." When he recovered he hoped his friend had complied with his request, but begged he would inform him whether he had given him any opium or not. "If I had not," said the other, "you would not have been here to ask the question."

Glynn was also a poet; it has been said that "a physician should be a kind of poet," on which Sir Clifford Allbutt commented: "A hard saying, but to their patients what are the most scientific physicians if they be διανοητικοι πνευμα μή ἔχοντες (if they know all things save the human heart)?" Glynn certainly had a heart, for, though enjoying the best practice in Cambridge and Ely, whither he went once a week, he was too generous to become rich. It is said that a fool and his money are soon parted, but the converse, that a man who does not stick to his money is a fool, is hardly justified, at any rate as shown by two incidents in Glynn's life:



ROBERT GLYNN CLOBERY, M.D., F.R.C.P.

Among Glynn's numerous gratuitous patients there was a boy whom he often visited although the roads were almost impassable, and supplied with port wine till he recovered. When, after some time, the boy's mother came to see Glynn, bringing a huge wicker basket, the following dialogue took place: "I hope, my good woman, your son is not ill again?" "No, Sir, he was never better; but we can't get no rest for thinking of all the trouble you have had—and so my boy resolved this morning on sending you his favourite magpie." The doctor got out of the difficulty diplomatically by praising the bird, thanking the boy, and saying: "As I am a good deal from home, and my servant is a careless fellow, I am afraid he should forget to feed him; I must therefore request to have him kept for me, and I will allow a shilling a week for his board as long as he lives." There was no demur to this, and a month's payment was made in advance. The incident was put into verse, "Benevolus and the Magpie," by the son of the regius professor of physic, R. Plumtre.


Sir Busick Harwood, m.d., f.r.s., Professor of Anatomy (1785–1814), Downing Professor of Medicine (1800–1814).

The other incident is of a rather different character and concerns the marriage on July 21, 1798, of Sir Busick Harwood, the ribald professor of anatomy, to the only daughter of Sir John Peschell, Bart., at which according to *The Cambridge Chronicle* "the Venerable Dr. Glynn performed the office of father." On more than one occasion before this, Harwood had said in public: "I am going to do a damned (or devilish) foolish thing: I am going to be married"; then on being questioned about the lady's means, he replied: "She has not a great deal of that, but we are both great favourites with old Dr. Glynn, who has plenty, and no one to leave it to. It will be a devilish odd thing if we don't get a good deal of his cash." According to the plan of the amiable couple, Miss Peschell wrote to her "so dear and kind friend" for his advice and probation; but the reply was rather chilly and to the effect that she was of an age to decide for herself and he hoped she would decide in such a way as to promote her future happiness. Eventually he left them a hundred pounds each. Glynn was offered the regius professorship in 1793 by William Pitt but refused it, and Pennington was appointed.

Sir Busick Harwood (1745–1814)

Having practiced as a surgeon in India and thereby amassed wealth, he came up rather late as a Fellow-commoner to Christ's College, Cambridge, where he lived extravagantly, being a *bon vivant* and "witty but very licentious in conversation," as Henry Gunning records. He was enthusiastic on the subject of blood transfusion, wrote his m.b. thesis (1785) on the subject, the year after his election as a Fellow of the Royal Society, and demonstrated this procedure on animals on several occasions to crowded Cambridge audiences. He became professor of anatomy in 1785 and stuck to this post for the rest of his life, although he was also Downing Professor of Medicine from 1800 to 1814. He was knighted in 1806. He wrote very little except a well-illustrated "System of Comparative Anatomy and Physiology" (1795, Cambridge). His customs and manners were rather remarkable: during his morning walk in term time he collected guests for his 2 p.m. dinner at which not infrequently he carved the turbot which had been dissected by his demonstrator for the previous day's lecture, the guests almost always going from dinner to the 4 p.m. lecture. Having quarrelled in Addenbrooke's Hospital with Sir Isaac Pennington, he sent him a challenge to a duel, which received a contemptuous silence, the cartel not even being opened; but the messenger, an undergraduate, retailed this morsel of news to the London papers. In 1792 there were riots in Cambridge and the Dissenters were considered enemies of the King; Sir Busick Harwood (who had until within a very short period of that time professed himself a Whig) is credited with the following *obiter dictum:* "In general every man ought to be considered honest until he has proved himself a rogue; but with Dissenters the maxim should be reversed, and every Dissenter should be considered a rogue, until he has proved himself to be an honest man."

Having been connected with three Colleges, Christ's, Emmanuel, and Downing, and holding two professorships, he died in Downing in 1814, and was buried in the lawn outside the Master's lodge. Surprise has been expressed that the present successful Vice-Chancellor "can possibly live opposite the grave from which proceed the mephitic vapours of that old scoundrel." The grass over his remains certainly tends to become brown and dried up; this is not due to any heat conducted from Hades but because his vault comes close to the surface, and indeed was consecrated as part of the site of the intended College Chapel; lack of funds, however, prevented the College authorities, though they did their best, from fulfilling Sir Busick Harwood's oft-expressed wish that he should be buried in the College Chapel.

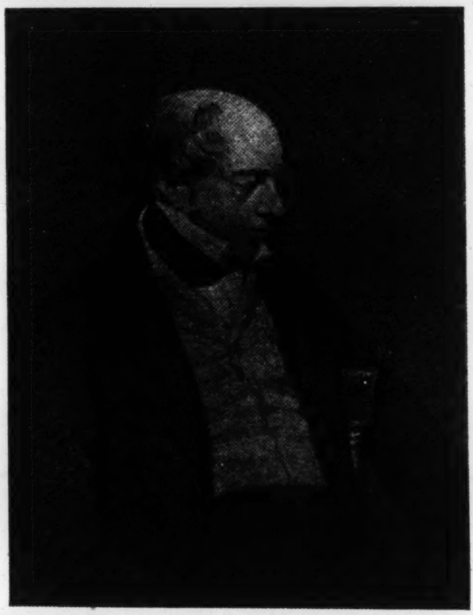
SIR ISAAC PENNINGTON (1745–1817)

Sir Isaac Pennington was 15th Wrangler in 1767 and for a year was in charge of an observatory on the tower over the gateway between the second and third courts of St. John's College. He was professor of chemistry for twenty years (1773–1793) and from 1793 until his death regius professor. He delivered the Harveian Oration at the College of Physicians in 1783, and was knighted in 1795 on the occasion of a congratulatory address from the University to George III on his escape from assassination. His commanding figure is well shown in R. Ackermann's "History of the University of Cambridge," Volume II, in which the colored plate of the "Doctor of Physic" is believed to represent him. W. L. Mansel, Master of Trinity and maker of epigrams, wrote of Pennington:

SIR ISAAC PENNINGTON, M.D., F.R.C.P., PROFESSOR OF CHEMISTRY (1773–1793), REGIUS PROFESSOR OF PHYSIC (1793–1817).

> When Pennington for female ills indites
> Studying alone, not what, but how he writes,
> The ladies, as his graceful form they scan,
> Cry, with ill-omened rapture, killing man.

Like Caius, he was unmarried and so was able to be a generous benefactor not only to his own College but to the University, to which he gave a small but choice anatomical collection formed by Thomas Lawrence (1711–1783), reader in anatomy to the University of Oxford, president of the College of Physicians for seven years, the friend of Samuel Johnson, and described as so pious, learned and skilful in his profession that the world was not worthy of him. Sir Busick Harwood's anatomical collection was bought by the University and added to this.



JOHN HAVILAND, M.D., F.R.C.P., PROFESSOR OF ANATOMY (1814–1817), REGIUS PROFESSOR OF PHYSIC IN THE UNIVERSITY OF CAMBRIDGE (1817–1851), LINACRE LECTURER (1817–1822 AND 1826–1847).

JOHN HAVILAND (1785–1851)

John Haviland was 12th Wrangler and Linacre Lecturer at St. John's College for two periods, Sir Thomas Watson intervening (1822–1826); in 1817 he succeeded Sir Isaac Pennington who had held this office for fifty years, and after the Watsonian interlude held it again, this time for twenty-one years until 1847. In 1814–1817, as professor of anatomy (not human anatomy in particular), he gave the first regular course on the anatomy of man. On the death of Pennington in 1817 he succeeded him again, this time as regius professor, and held the post until his death. He was Harveian Orator in 1837; in 1839 ill health made him resign his hospital work and depute some of his professorial work to Dr. Bond. But in spite of this the Medical School owes much more than is now realised to him, for had it not been for his influence and insistence the medical faculty might have been abolished, and it has been said that its subsequent success was largely due to his exertions. He was the first to give regular courses in pathology and the practice of medicine, and to make the medical examinations a real and rigid test instead of a rather farcical form, which it has been whispered were sometimes post-prandial, at least in point of time. As he wrote little, and personal memories die comparatively young, his name is seldom mentioned now, but if the doings of the Medical School since his time be a monument to his saving grace, he could hardly have wished for a greater.

SIR THOMAS WATSON (1792–1882)

Sir Thomas Watson was 10th Wrangler (1815), a Fellow of St. John's, Linacre Lecturer there (1822–1826), and Junior Proctor (1823), before he went up as M.D. to London, becoming physician to the Middlesex Hospital in 1827. Four years later he became lecturer on forensic medicine at King's College. In 1835, after another interval of four years, he succeeded his colleague at the Middlesex, Dr. Francis Hawkins, familiarly called "Fanny of the middle sex," as lecturer on medicine at King's College. The mention of the Middlesex Hospital recalls its once senior physician, Henry Thompson (1815–1897), a junior colleague of Watson and Hawkins, who was Senior Fellow of St. John's and from his fine aspect was known as "Jupiter Thompson." I heard his obituary at the College of Physicians, and, though these are sometimes occasions for kindly exaggeration, this was not so with Sir Samuel Wilks, who described Dr. Henry Thompson as "a most cautious physician, who was said to have once prescribed half a leech." Watson's famous lectures on "The Principles and Practice of Physic" were first delivered in 1836 and published in the *Medical Times and Gazette*, 1840–1842, and then in book form in many editions, earning him the title of the "Cicero of English Medical Literature." These lectures had a very long life as a sound guide to clinical medicine and set an example of style which should still command admiration and imitation. But "our little systems," of medicine, as of all other things, "have their day and cease to be" read, so it has been even with Watson's Physic. His portrait, painted in 1867 when he terminated his presidency of the Royal College of Physicians, by George Richmond, R.A., engraved by George Cousins, R.A., is extremely pleasing, his chin, not perhaps his strongest feature, being discretely shaded from criticism by a thoughtful hand.

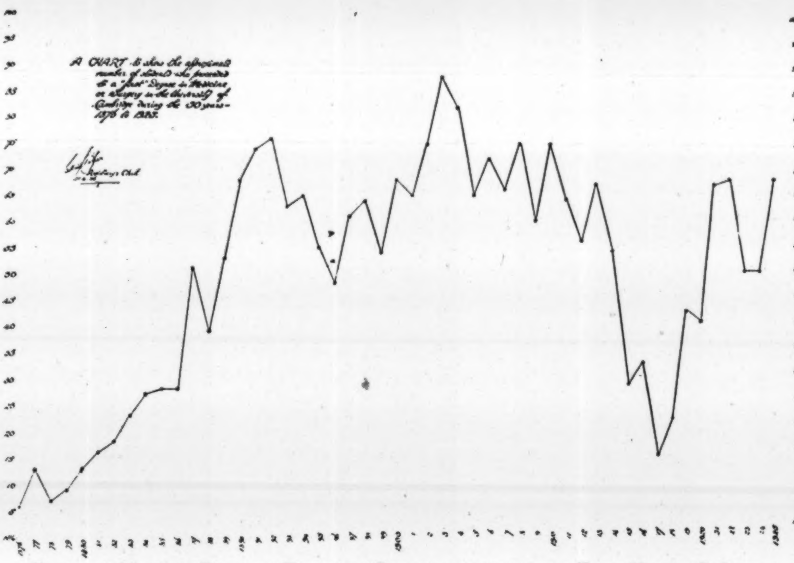
SIR THOMAS WATSON, BART.

HENRY J. HAYLES BOND (1801–1883)

Henry J. Hayles Bond was regius professor for twenty-one years (1851–1872) and then resigned to live another twenty-one years, a rather remarkable if not unprecedented course. In 1882 he broke the neck of his femur, but contrary to experience it united so perfectly and without any shortening that practitioners other than he, who diagnosed and treated it, declared that there could not have been a fracture. After Bond's death the bone was removed and at first this appeared to be confirmed, but a section of the bone proved that the original diagnosis and treatment were correct. The bone was preserved in the Museum, fit resting place for a regius professor's remains. Retiring and unobtrusive almost to timidity, he published very little; but he was a sound physician and a scholar. He practiced the open-air treatment of pneumonia, so Dr. Arnold Chaplin tells me, with success. During his term of office the Medical School began to wake up, and indeed some such change was urgent, for from 1833 to 1858 the average number of M.B. degrees in the year was less than four. Probably Humphry and

SIR THOMAS WATSON, BART., M.D., F.R.S., PRESIDENT OF THE ROYAL COLLEGE OF PHYSICIANS OF LONDON (1862–1867), LINACRE LECTURER (1822–1826).

Paget's influence was now at work, for in the fifty years, 1876–1925, the registrary's clerk, Mr. W. Baker, finds that approximately 2500 first degrees in Medicine and Surgery have been conferred; the largest number was ninety in 1903; in 1917 there were fourteen and in 1925, sixty-eight.



GRAPH OF MEDICAL DEGREES TAKEN AT CAMBRIDGE DURING THE FIFTY YEARS 1876–1925.

SIR GEORGE EDWARD PAGET (1809–1892)

Sir George Edward Paget was the third[1] son of Samuel Paget, brewer of Yarmouth; he and his younger brother James, who rarely took any important step in life without consulting him, have been compared with William and John Hunter. He was educated at the Charterhouse, and went up to Caius when sixteen years old, was 8th Wrangler in 1831 and Fellow (1832–1851), bursar (1835–1838), and steward (1839–1841) of Caius, and being elected to a medical Fellowship was for forty-five years (1841–1884) physician to Addenbrooke's Hospital. In 1842, during the regius professorship of Dr. Haviland, he was instrumental in initiating the clinical examination of patients for the medical degree; this was the first regular clinical examination held in the United Kingdom, and this example has been widely copied. He was president of the General Medical Council (1869–1874), but did not rival Sir Donald MacAlister, who has been president of that much criticized body since 1904. As regius professor, 1872–1892, he was a dignified figure, and the most distinguished in this office save Glisson; his lectures contained much personal experience of local interest, such as remarkable instances of survival of people buried in the snow for many days near Cambridge.

Mrs. Elizabeth Woodcock, aged 47, of Imping, a village 3 miles north of Cambridge, lost her way on returning from market on the evening of February 2, 1799, and was buried 7 feet deep in the snow for eight days and nights; she retained full possession of her senses all the time, and was dug out on 10 February. She died on July 24, 1799. A print showing her posture when found was published at Cambridge in 1799, and republished in 1844 by J. Hall, Proprietor of the "Views of Cambridge."

Paget combined rapidity of decision with accuracy of judgment. When asked to approve the title of a thesis he liked to explain that he had once been obliged to refuse the proposition "That mother's milk is the best for infants," as he was incapable of bringing arguments against it. He was asked, but declined, to stand as Member of Parliament for the University in 1886. His share in the success of the Medical School has probably not been justly appreciated, for in addition to being the quiet but moving force behind his two predecessors he was instrumental in establishing the Natural Sciences Tripos in 1851 and took an active part in the early examinations. Further, it was during his term of office that the Diploma of Public Health was started in 1875, and thus set an example to the other universities and examining bodies.

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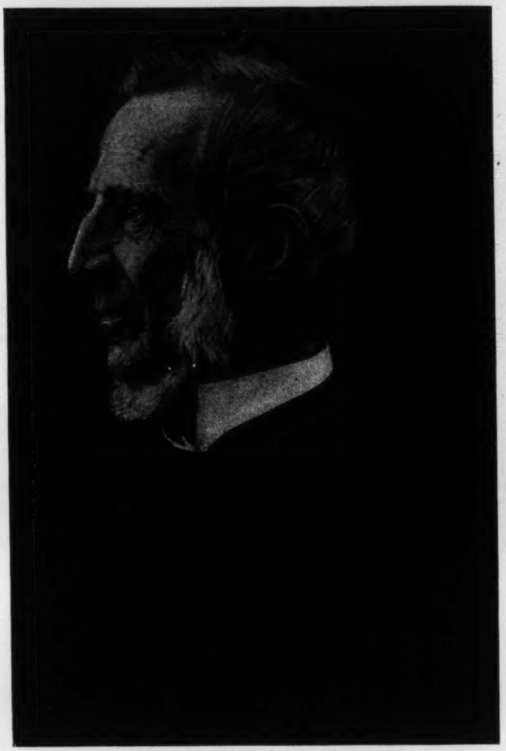
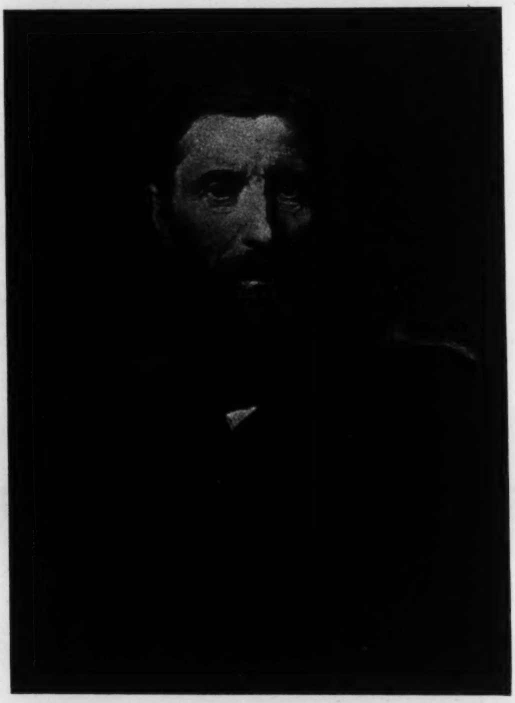
[1] The Dictionary of National Biography states that he was the seventh son; the information that he was the third son was supplied by his nephew, Right Rev. H. Luke Paget, Bishop of Chester.



Sir George Edward Paget, k.c.b., m.d., f.r.s., Regius Professor of Physic (1872–1892).

Sir George Murray Humphry (1820–1896)

Sir George Murray Humphry was the third son of W. W. Humphry, a barrister at Sudbury in Suffolk, an elder brother, W. G. Humphry (1815–1886), becoming a well-known divine in London. When sixteen years old he was apprenticed to J. G. Crosse, f.r.s. (1790–1850), the famous lithotomist of Norwich, who exerted a powerful influence over his pupil. In 1839 Humphry went to St. Bartholomew's Hospital and followed the teaching of Sir William Lawrence, James Paget and Peter Mere Latham, to some extent modelling himself on the last of these great teachers. He was admitted a member of the Royal College of Surgeons in November, 1841, and a licentiate of the Society of Apothecaries in the following year. In that year, when twenty-two years old, he was, with the help of the brothers James and George Paget, elected surgeon to Addenbrooke's Hospital, being the youngest hospital surgeon in England, and never, according to his own statement, having amputated even a finger.



Sir George Murray Humphry, m.d., f.r.s., Professor of Human Anatomy (1866–1883), and of Surgery (1883–1896).

But in no way daunted he at once initiated clinical lectures in the Hospital with George Paget. In 1844 after the Fellowship of the Royal College of Surgeons was instituted in 1843 he was, in virtue of his office, elected a Fellow, and in 1879 he gave the Hunterian Oration at that College in which he insisted on the philosophical outlook of John Hunter (to whom it may be noted he was compared after his death by C. B. Lockwood) and, no doubt recalling his early days with Crosse, paid a tribute to the surgeons of Norwich, a line of men which he considered no other provincial town could rival. He declined to be nominated for the offices of vice-president and president of the College of Surgeons as it would have interfered too much with his work at Cambridge.

In 1866 he was made the first professor of human anatomy in the University, the comparative anatomy which had previously been included with it being undertaken by Alfred Newton, the eminent ornithologist, as professor of zoology and comparative anatomy. The previous professor of anatomy, who had long been assisted by Humphry and had been responsible for the whole subject, was the Reverend William Clark, M.D., F.R.C.P. (1789–1869), appointed in 1817, and was colloquially known as "Bone" Clark to distinguish him from "Stone" Clark and "Tone" Clarke, namely Edward D. Clark, professor of mineralogy (1808–1822), and John Clarke (afterwards Clarke-Whitfield), professor of music (1821–1836). In those days this name with its various spellings must have been, like the Thomsons and Thompsons of the later part of the nineteenth century, remarkable for its scientific distinction. Like all good surgeons, Humphry was keenly interested in morbid anatomy and was indefatigable in collecting specimens for the Museum, which is now appropriately called the Humphry Museum. He had no recreations except travel and then mainly with the object of seeing other museums. Self-denying as regards his own creature comforts, he was much given to hospitality and private generosity. With Sir William Turner he founded *The Journal of Anatomy and Physiology* (1866), and when president of the British Medical Association at Cambridge in 1881 originated a system of collective investigation of disease. His attractive monograph on "Old Age" (1889) was based on analysis of 895 persons over eighty years of age, of whom seventy-one were centenarians. It is a matter for regret that no Boswell or Harvey Cushing ever wrote his life.

It is thirty years since his death in September, 1896, and yet his pupils have an extremely vivid recollection of the most impressive teacher they ever had the good fortune to meet; they recall him perched on his stool in the Museum or leaning on his stick outside Addenbrooke's with his attenuated figure, mobile features, aquiline nose, glittering eye, facial pallor and raven-black hair, recalling Rembrandt's picture of the Jewish Rabbi, and by his compelling personality The Ancient Mariner. His pupils, at least some of them, showed his influence by unconsciously imitating his manner. Always fragile, he had phlebitis on three occasions, laughed at those who kindly told him that he would die, and wrote his M.D thesis (1859) "On the Formation of Clots in the Venous System during Life," recording his own case.

He had the genius, perseverance and collecting talent of the Chosen People, and it has been said, but proof seems wanting, that his ancestors had a Hebrew name. He found the Cambridge Medical School insignificant, he left it what it is; he came friendless and poor, he died rich in repute and in pocket. A great anatomist, his book on "The Human Skeleton" (1858) made the dry bones to live and was a mine from which much ore was extracted by others. His difficulties in obtaining bodies for dissection would have been much more acute had he not possessed the faculty for keeping his own counsel. He was ably seconded by one, Sims, whose excellencies Humphry summed up by saying that he was "the most truthful liar he had ever known." He delighted in meeting young men and in making them think by his oft-repeated query "Why?" He was wonderfully shrewd, full of resource, and usually got his own way, a measure of success not always popular with those who thought differently. Impressive were his aphorisms, such as his directions for making an examination: "Eyes first and much, fingers next and least, tongue not at all," and to students learning their bones: "Observe much, think much, read little."

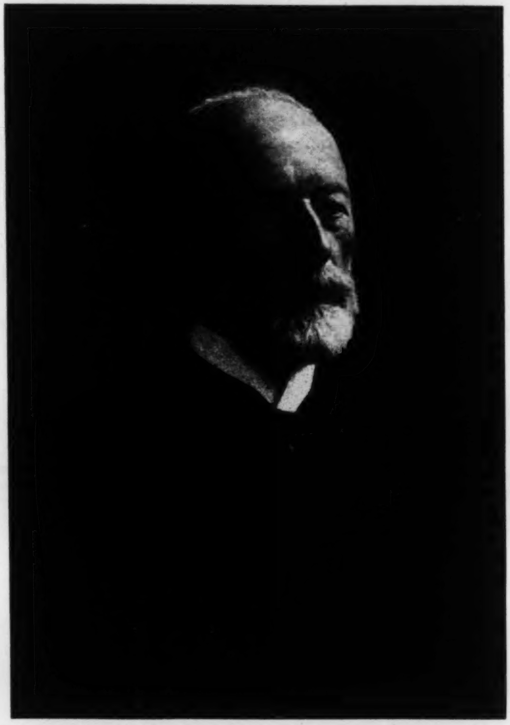
Some of the stories about Humphry are also told of other surgeons, such as foresight in always taking a stone with him when on the way to do a lateral lithotomy. One well-known incident is undoubtedly true; when with his leg in a splint, as the result of leaving a train in motion, he was examining at the College of Surgeons, a candidate keen to obtain knowledge, even at the cannon's mouth, slipped a coin into his hand and said: "What is the matter with you, my man?" Humphry, jumping to the state of affairs, laconically confessed to a common monosyllabic malady, and a little later interviewed the now embarrassed student. His power of repartee was so keen that the best intellects in the profession were much on their guard when they crossed swords with him. An incautious barrister in court asked him if he was accustomed to lose many of his cases, whereupon Humphry at once remarked that he did not conduct his surgical cases as the cross-examiner did his legal cases, "Otherwise he would lose them all." Once just before an operation on an oldish man Humphry asked the patient if he had made his will; on the reply in the negative, Humphry proceeded with his own hand to write it out and, abstaining from witnessing it himself, gave this privilege to his assistants; the rather ominous prognosis implied in the first question proved to be correct. He not infrequently made a butt of one of the students, no doubt for his and others' good; on one memorable occasion his victim made a correct answer, and followed it up by the rather unwise remark: "You seem surprised, Professor," for the prompt retort: "So was Balaam when his ass spoke," was hardly so complimentary as the proud student hoped. This story reminds me of a Fellow of the same College as Humphry who, when a rather prolonged lecture was interrupted by the shuffling of impatient feet, exclaimed: "A few moments more, please gentlemen, I still have a few pearls to cast before you." Humphry was knighted in 1891 when such honors for medical men were comparatively rare, and at a dinner given to him by his pupils light-heartedly said that he hoped another dinner would be given when he was made a peer, for this was some time before 1897, when a peerage was conferred on Lister; but the title he valued most was that of Professor.

WILLIAM HARVEY (1578–1657)

Not to mention the immortal William Harvey of Caius would be to leave out the most distinguished medical son of Cambridge, to recite Hamlet with the omission of the Prince; but in truth his after-life was concerned more with Oxford, and as this is not a Harveian Oration, of which there have been 269, I will pass on to one who, by creating the Cambridge School of Physiology, carried out his precept to "Search and study out the Secrets of Nature by way of Experiment," and who with Sir George Paget and Sir George Humphry made the modern Cambridge School of Medical Science.

SIR MICHAEL FOSTER (1836–1907)

Sir Michael Foster was, like Humphry, an importation, and not a son of Cambridge University though, like Paget and Humphry, born in a neighboring county. He was originally a classical scholar, and to this perhaps may be traced the pure English and charming style of his famous textbook, which later (1876) formed an influential milestone in the history of physiology; but his non-conformist heritage blocked his way to the older universities. After a brilliant career at the University of London, and starting on original work, signs of pulmonary tuberculosis necessitated a sea voyage in hope of recovery, but this was fruitless and he accordingly retired from London in 1861 to join his father in a country practice, and then recovered.



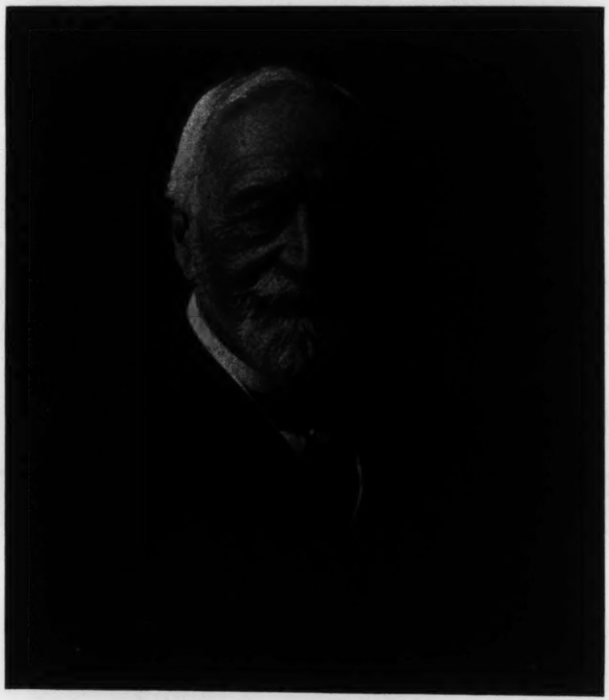
Alexander Macalister, M.A., M.D., LL.D., D.SC., F.S.A., F.R.S., Professor of Human Anatomy (1883–1919).

In 1867 he accepted an invitation from his old teacher Sharpey to give a practical course in physiology at University College, and soon taught biology at South Kensington under Huxley, who in 1870 was, with George Henry Lewes and George Eliot, responsible for his appointment as praelector in physiology at Trinity College, Cambridge. In this capacity he was given as a laboratory half a room in the New Museums, his companion being the venerable Plumian Professor of Astronomy, James Challis (1803–1881). Foster, ever anxious to encourage research and not without wise humor, incited a student to investigate the dissociation products of protein which entailed the prolonged concentration of odoriferous fluids; not only did the Plumian Professor vacate his share of the premises, but he spread abroad the tale of his experience, and, *post* or *propter*, Foster got progressively more elbow room. His charm and enthusiasm for physiology and biology at once attracted pupils, some of whom had no previous leanings to science, such as F. M. Balfour, S. H. Vines, Gaskell, Langley, Lee, and later they became as the sands of the sea for multitude. He established a school of research not only in physiology, but in other branches of biology: embryology (F. M. Balfour) and vegetable physiology (S. H. Vines, Francis Darwin). He originated the practical course in physiology which has always seemed to us the most natural thing in the world, and was responsible for much of the eminence of the British school of physiology.

Looking back at Cambridge physiology there seems to have been a kind of triumvirate with Foster as the organizing director, W. H. Gaskell (1847–1914) as the man of great conceptions and J. N. Langley (1852–1925), whose patient work for fifty-two years was of such a character that his results have always remained unshaken. It is interesting to note that the hobby of all three was the same, their garden. Foster was a philosophical organizer, was secretary of the Royal Society for twenty-two years, and it is difficult to say how many undertakings and men's lives were directed and determined by his advice. The Physiological Society (1875), the *Journal of Physiology* (1878) and the International Congress of Physiologists (1889) were largely his children. He made a great school of physiologists and so indirectly advanced scientific knowledge enormously. It is not surprising that one who gave so much help and guidance to others had little time for private research, but the work of his pupils and the preeminence of British physiology form a worthy memorial.

ALEXANDER MACALISTER (1844–1919)

Professor Alexander Macalister's early life reads more like a romance than sober fact. One of a large and needy family, he began his medical studies at the early age of fourteen, became demonstrator of anatomy at the Royal College of Surgeons of Ireland at sixteen, and doubly qualified at seventeen. At Trinity College, Dublin, he was elected professor of zoology while an undergraduate and could not proceed to an honor's degree as the would-be candidate would have to have been his own examiner, a truly Gilbertian position. In 1877 he was appointed professor of anatomy and surgery in Trinity College and surgeon to Sir Patrick Dun's Hospital. In 1883 he moved to Cambridge as professor of human anatomy in succession to Sir George Humphry, who had resigned this office and its emoluments to be the first and then unpaid professor of surgery. At Cambridge Macalister labored devotedly for thirty-six years, a period coinciding in length with that of Sir William Turner at Edinburgh. He took a very broad view of human anatomy, like his successor, including embryology, histology and anthropology, and was at once one of the most learned and truly kindly of men.



Clifford Allbutt

SIR CLIFFORD ALLBUTT (1836–1925)

It is too soon to say much, and indeed unnecessary, for to you it would be a twice-told tale of a man of infinite variety. With classical tastes, he travelled in Italy with the intention of becoming an artist, and the almost accidental reading of Auguste Comte's "Philosophie positive" transformed his outlook on life by turning his thoughts to science and medicine. He played many parts in his long life and always with distinction: as "Allbutt of Leeds" with a consulting practice from the Trent to the Tyne, as a commissioner in Lunacy, and as regius professor of physic (1892–1925) for thirty-three years. His appointment was a departure, as was that of Sir William Osler at Oxford, from the custom of taking a local physician, and in the case of the Brothers Regii, as Sir William once had his colleague and himself announced at dinner, the success was beyond expectation. He was the model from whom George Eliot drew Tertius Lydgate in "Middlemarch" (1871), though the portrait is not exact, for Lydgate was made to die in London before 1871, and George Eliot predeceased her friend the future professor by forty-five years; and further Oscar Browning, the famous "O.B.," who by what was termed "a piece of heavy bureaucratic humour" was created O.B.E., confessed that he was in some measure the model for Lydgate. Wise with long experience, Allbutt remained youthful in mind till the end, ever open to what was new as long as it was true, and never made a mistake by backing some fallacious though at first sight promising departure. For sixty years he contributed to medical science and much of what he pointed out has been so incorporated in common knowledge that his share is forgotten. He thought and worked on big lines, had high ideals, and was a most modest gentleman. His fame will increase when with the passage of years his work is seen in due perspective.

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FRANCESCO REDI (1626–1697)

PHYSICIAN, NATURALIST, POET

By RUFUS COLE, M.D.

NEW YORK, N. Y.

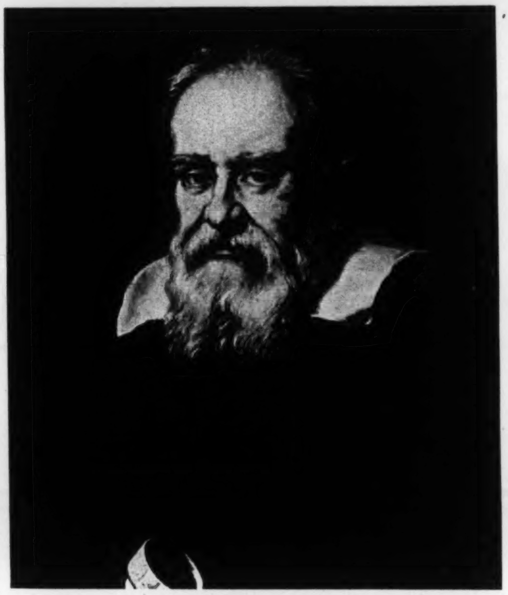
THREE hundred years ago, on February 18, 1626, Francesco Redi was born at Arezzo in Tuscany. This was the ancestral seat of the Redi family, which had long been prominent in Tuscan affairs. He was destined to become the leading physician in Italy, a scholar held in high esteem by the leading literary men of the time, a scientist who made at least one contribution of the very highest significance, and a poet whose verse has survived at least three centuries.

His father was physician to the Grand Duke of Tuscany, and Francesco's boyhood was passed in Florence. At this time Florence was the most interesting city in Europe, and the time was suitable for the appearance of a hybrid of the artist-scientist type. At the beginning of the seventeenth century Dante and Petrach, Ghiberti and Donatello, Michelangelo, Raphael, Fra Angelico, Botticelli and Leonardo da Vinci were dead and buried. But their works remained and if today one cannot live in Florence without feeling the influence of these masters who lived and walked and worked and created in this wonderful city, how much more must their immortal spirits have influenced one spending his boyhood there in the seventeenth century.

It is generally considered that the glory of Florence reached its zenith at the end of the fifteenth century, and that its decay began with the end of the older branch of the Medici family. But although the glory of Florence in art and learning no longer shone with the same brilliancy under the younger branch of the Medici family that it did under the older, yet during the seventeenth century science blossomed in Florence with as far reaching and significant results to mankind as had the awakening in art and learning two centuries before. "The younger branch [of the Medici] did for Science what the older branch had done for learning." And it was in the very center of this golden age of science in Florence that Francesco Redi lived. Is it surprising, therefore, that he became a poet as well as a scholar and scientist? One almost wonders that he did not become a painter as well.

As a boy he was educated in the Jesuit schools where he studied Greek and Latin and Italian literature and rhetoric. While it is probable that he was shielded by the Jesuits from the "corrupting influence" of the new science, yet he must have had his interest awakened and his mind stimulated by the new discoveries and the new ideas which were then creating the greatest excitement in intellectual and ecclesiastical circles.

During the preceding century there had come into certain men's minds a definite resistance to depending on authority alone for opinions concerning natural phenomena. For the first time in fourteen centuries man studied the structure of man with his own eyes, and in 1543 this break with tradition had been signalized and immortalized by the appearance of Vesalius' masterpiece. Copernicus and Kepler had created a new kind of universe in the mind of man. Most important of all, so far as the influence of the period on the mind of Redi is concerned, is the fact that at the time of his birth there was living in Florence a man who was investigating Nature with new tools and with new methods. When Redi was six years old this man, Galileo, was cited to Rome by the Inquisition and, after his return the following year, lived in the seclusion of his villa near Florence, which was the prescribed condition of his comparative freedom. He died there in 1642 when Francesco was sixteen years old. While Redi's later scientific studies were not concerned with the problems on which Galileo worked, yet the method employed by Redi was that of Galileo, and his scientific life can be traced directly to the influence of this wonderful man.



GALILEO [1564–1642].

After completing his studies in the Jesuit school, Redi entered the University of Pisa, from which, in 1647, he received the combined degree of Doctor of Medicine and Philosophy, not an unusual procedure in those days. At this time the leading universities of Italy were Padua, Bologna and Pisa. Padua, which was under the control of Venice, was at this time the chief rival of the University of Pisa, which was under the direct protection of the Grand Duke of Tuscany. It was from Padua that Galileo was persuaded to return to Florence as mathematician and philosopher to the Grand Duke and it was from Bologna that Malpighi was brought to Pisa as professor of what would recently have been called the institutes of medicine. Redi, though never a professor at Pisa, was closely associated with the work of this university during the remainder of his life. While at the university Redi was chiefly interested in literature, but while there he began also to make observations concerning animals and plants—natural history studies we should now call them.

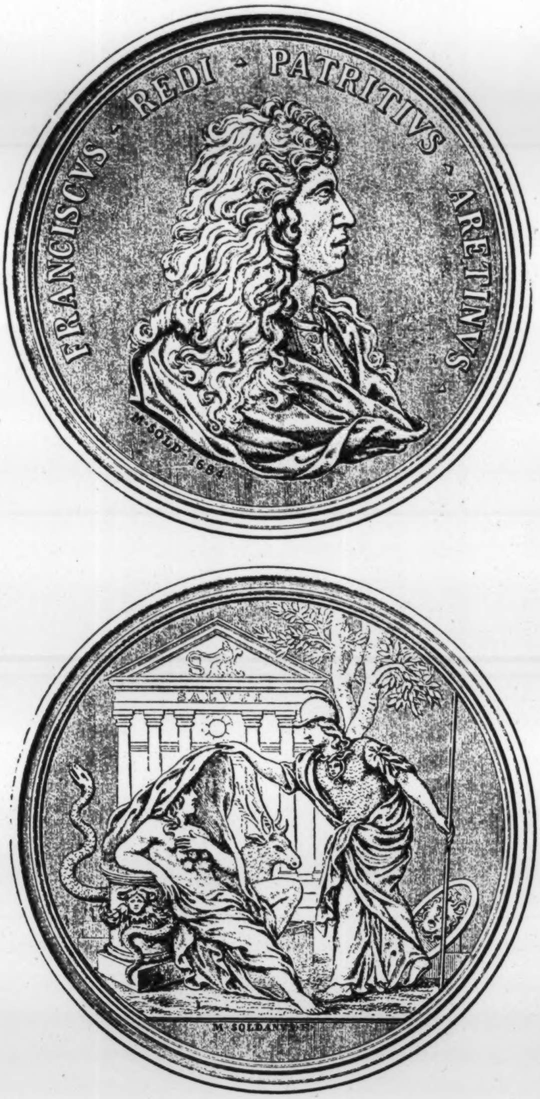
After leaving the university, he spent five years without definite vocation. These post-university, so-called "travel years," which in European countries even up to the present are regarded as important, or at any rate perfectly respectable, have by us, probably owing to our Puritan antecedents, always been looked upon askance, at least when indulged in by the male members of the family. One wonders whether this is not one of the reasons why our youths have not developed a greater interest in the arts. Redi spent his time at first in taking lessons in French and Spanish, fencing, dancing and drawing, and in playing the flute. He had already won a reputation through his knowledge and mastery of the languages, both ancient and modern, and he was soon called to Rome to give lectures on literary subjects. Even at this time his reputation in philology had grown sufficiently for him to be chosen by the Accademia della Crusca to be an editor of the Tuscan vocabulary.

During the years of travel he seems to have spent much time in Rome, working in the Vatican libraries and indulging his tastes as a bibliophile and collector of manuscripts. To his taste and interest in collecting manuscripts we owe one of our greatest literary possessions, for the manuscript of Benvenuto Cellini's autobiography was preserved in Redi's collection. "If Redi had done nothing else than help to preserve this priceless mirror of the late Renaissance, he would have earned, by that alone, the undying gratitude of posterity." He apparently kept up this collector's interest during his entire life and during his later years he discovered and republished what is probably the first reference to the use of spectacles. It is generally held that spectacles were first used early in the fourteenth century and the names of

Salvino d'Amarto of Florence and Allesandro della Spina of Pisa are associated with the special application of lenses to this use. In searching through the old manuscripts of a monastery, Redi came across one dated 1289 in which a monk wrote: "I am so weighted with years that without the glasses, called *occhiali*, I could neither read nor write. These have lately been invented to the convenience of poor old people whose sight is enfeebled."

During his *Wander Jahre* Redi spent much time studying languages, including Spanish, English, French and also Arabian. He may also have commenced to try his hand at writing poetry, though his published verses only appeared many years later. All this time, however, he had not lost his interest in medicine and natural science. But these years without a vocation at last came to an end and he returned to Florence, at the age of twenty-six, to take up the practice of his profession. An accident seems to have brought him prominently to the attention of the Grand Duke and so made easy his rapid professional advancement. While on a hunting expedition, the Grand Duke was injured and Francesco, probably owing to the absence of his father, was called to attend him. It is not surprising that this brilliant and cultivated young doctor made a very favorable impression on Ferdinand; this would probably have happened even if Redi had possessed very little medical knowledge. From this time forward Redi occupied a very intimate and confidential position at the Tuscan Court and in later years he was apparently consulted on all state matters. He was not made *medico primo*, however, until his father retired from this office. This was in 1666, when Redi was forty years old. He was apparently a wise and skilful physician and this, combined with his charm and versatility, made him much in demand by the wealthy and powerful. In his treatment he showed a skepticism somewhat unusual for the time, and it is said he told his patients that they had one thing more to be feared than the disease from which they suffered, namely, the medicines that were proffered to cure them. He returned to Hippocratic simplicity in treatment and was a great advocate of the use of water. His contributions to clinical medicine are preserved in his "Consultations." These constitute the records of about 100 cases in which the description, treatment, prognosis and so forth are given in quite modern fashion. His medical work, however, shows no extraordinary brilliancy and it does not appear that he was greatly interested in the purely clinical features of disease. His greatest work lay in other directions, in the study of certain fundamental biological problems and in parasitology, and it is on account of his discoveries in these fields that he deserves our greatest praise and honor.

While Redi, even in his youth, had some interest in natural science, this did not become a dominating passion until after his entrance into medical practice and into life at the Tuscan Court. The reigning Duke was Ferdinand II, in many respects an interesting and an admirable man, who early in his reign showed his intention of protecting and aiding learning and the arts, and sciences as well. But Ferdinand entered into his reign under a most serious handicap. His father, Cosimo II, died when Ferdinand was ten years old and his grandmother and mother acted as regents for eight years. His grandmother was a woman of great force of character but completely under the domination of the church. Ferdinand was a gentle and affectionate boy and when he took over the reins of power his greatest desire was to secure peace. "But he had one fatal flaw—a want of strength of character." "He furnishes a strong illustration of the fact that the greatest crime of which one placed in any position of authority can be guilty is weakness." This probably is especially true of the ruler of a people like the Florentines, the streets of whose city, from the days of the Guelphs and Ghibellines to the Freemasons and Fascisti, have resounded with the cries and struggles of warring factions.



Francesco Redi

Medal of Francesco Redi and His Signature.

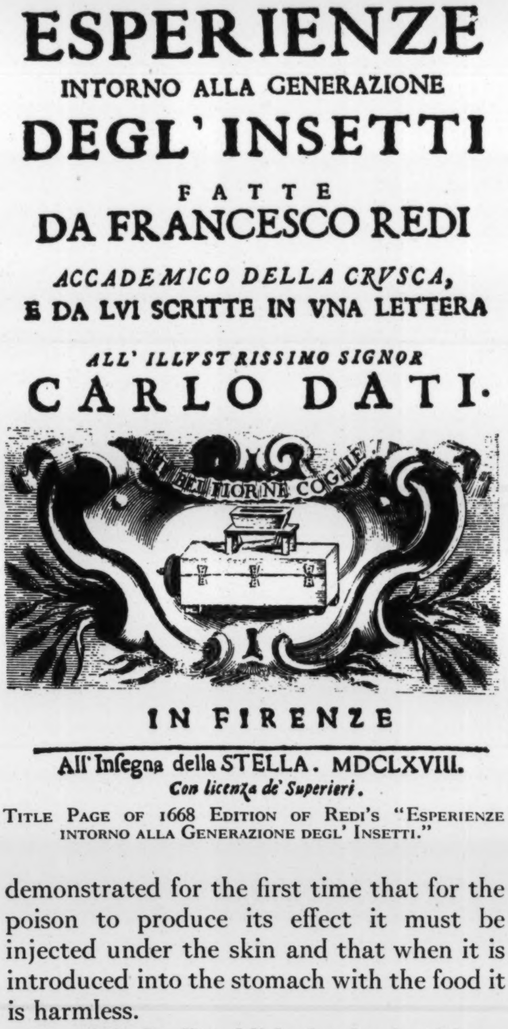
But whatever the reason, Florence was not prosperous in a material sense during the reign of Ferdinand II and that of his son, Cosimo III, for whom Redi also acted as chief physician. But though during this period Tuscany did not grow in temporal power and wealth, she did maintain the intellectual and artistic preeminence which had been gained in previous centuries, and it may even be questioned whether the contributions to science which Florence made at this period were not her greatest gifts to posterity. Early in his reign Ferdinand showed his intention of protecting and aiding learning and the arts and sciences. The time for the cultivation of the greater arts was apparently passed but the cultivation by Ferdinand of the pietra dura, or Florentine inlay, added greatly to the sum total of beauty, not only in Italy but in the entire world. While the Indian inlay work existed long before it received any influence from the West, it was a workman sent from the factories of Ferdinand II who introduced into India the wonderful delicate designs employed in inlay work which contributed toward making the buildings at Delhi and Agra, culminating in the Taj Mahal, the architectural masterpieces of the world. Ferdinand's action in the matter of Galileo has prevented his receiving his just appreciation as a patron of science. Indeed because of this he has long received the scorn of the scientific world, but it must be remembered that Galileo was really never tortured or imprisoned and that he was able to work unmolested and in comfort during the latter part of his life. This never could have happened but for the real protection and support of a ruler who appreciated learning and science.

Toward the middle of his reign, Ferdinand associated his three brothers with himself in the direction of affairs. His youngest brother, Leopold, he placed nominally in charge of political affairs, but Leopold devoted his enthusiasm and energies chiefly to the support of art and science. It is to Leopold that the world chiefly owes the great galleries of the Pitti and Uffizi and the preserving there of the unsurpassed works of art which the Medici had collected. But Leopold's chief interest was in the development of the new science. When Ferdinand II was thirty-two, shortly after Galileo's death, he had brought together the chief scientists of Tuscany in meetings held with some regularity within the palace. These meetings were called *Conversazione Filosofica.* Included among the most able and scientific men of the day which composed this group was Francesco Redi.

Now when Leopold began to share in the conduct of affairs with his brother, Ferdinand, he resolved to convert this organization into a purely scientific society, and its purpose is well indicated by the name adopted and by its motto. It was called the Accademia del Cimento (Society of Experiment) and its motto was *Provando e Reprovando.* Thus was emphasized the characteristic feature of the scientific method of the seventeenth century. As has been well said: "As regards science, in 1600 we are in the Middle Ages, in 1650 in Modern Times." In the seventeenth century unsupported beliefs became relatively unimportant, demonstrations were demanded. And for this, observation alone was not sufficient. Falling bodies had been observed from time immemorial. Natural phenomena are complex, and the facts and laws of Nature can only be determined if, in any given case, the factors involved be controlled, that is, if the experimental method be employed. While, of course, experimental methods had been used before the seventeenth century, it was Galileo who impressed upon the world the value of experiment. The dropping of light and heavy balls from the tower at Pisa and the employment of inclined planes to study the laws concerning falling bodies mark the beginning of an epoch which has changed our world by diminishing its size through increasing the rapidity of travel. It has made the transfer of thought almost instantaneous and has extended time by changing darkness into light. These changes have largely been the result of the application of the experimental method to the physical sciences. The significance of Redi lies in the fact that he applied the experimental method in an attempt to discover biological laws. It has required more time, however, to demonstrate the usefulness of this method in biology than in physics and it is only during the nineteenth century and chiefly the latter half of it that the experimental method in biology has been applied with great intensity.

The organization of the Accademia del Cimento, which is one of the events marking the inauguration of our Age of Experiment, occurred in 1657, five years before the Royal Society received its charter from Charles II, and its foundation undoubtedly stimulated the organization of all the other great scientific societies which have been so important in the cultivation of scientific research and progress.

The exact rôle which Redi played in the organization of the Accademia del Cimento is difficult to determine, certainly he was one of the most active and influential members. Among the other members were Viviani, and Torricelli, Borelli, and later the Dane, Stensen, both of the latter famous members of the medical profession. "The Society did not permit itself to be interested in metaphysical or theoretical discussions, but desired all their efforts to be concentrated upon experimentation, upon the creation of instruments, upon the establishment of standards of measurements and exact methods of research." During the ten years of its existence the Society well and successfully carried out these purposes. In 1667 an account of their researches was published under the title, "Saggi di Naturalis Esperienza fatta nell Accademia del Cimento." This work was translated into English by Richard Waller and at a meeting of the Royal Society on the twenty-seventh of November, 1683, this translation was ordered printed.



ESPERIENZE
INTORNO ALLA GENERAZIONE
DEGL' INSETTI
FATTE
DA FRANCESCO REDI
ACCADEMICO DELLA CRVSCA,
E DA LVI SCRITTE IN VNA LETTERA
ALL' ILLVSTRISSIMO SIGNOR
CARLO DATI·

BEL FIOR NE COGLIE

IN FIRENZE
All'Inſegna della STELLA. MDCLXVIII.
Con licenza de' Superieri.

Title Page of 1668 Edition of Redi's "Esperienze intorno alla Generazione degl' Insetti."

The first important independent scientific work of Redi was entitled, "Osservazione intorno alle Vipere," 1664. In this paper Redi described the studies he had made with various poisonous serpents, describing the poison glands and the fangs through which the poison is injected. He described experiments carried out by him which demonstrated for the first time that for the poison to produce its effect it must be injected under the skin and that when it is introduced into the stomach with the food it is harmless.

In 1668, Redi published a book with an interesting title, the translation of which is as follows: "Experiments concerning diverse natural objects and especially those which are brought from India, made by Signor Francesco Redi, and written in a letter to Padre Atanasio Circher, of the Company of Jesus." Atanasio Circher was the head of the Jesuit College in Rome and the letter is directed chiefly against the marvelous reports brought back by the Jesuit missionaries from India, America and elsewhere. Redi takes particular pains to overthrow the belief in the efficacy of the so-called serpent stones for curing snake-bite. He showed by repeated experiments on animals that this form of treatment was entirely without any beneficial effect. In some respects this book of Redi resembles the "Pseudodoxia" of Sir Thomas Browne which had been published a short time before (1645). Instead, however, of refuting error with error or, at any rate, only with opinions which seemed more reasonable than the original ones, as did Browne, Redi overthrew popular misconceptions by sound evidence, in many cases experimental.

Redi's masterpiece, however, and the work which has contributed almost entirely to his great reputation as a scientist, is that concerning experiments relating to the generation of insects. This first appeared in 1668 and in twenty years five editions had appeared. An English translation of this work, made by Bigelow, was published in 1909, and the quotations which I shall make are taken from this edition.

Redi, himself, well states the current opinion of the time:

> After a long period of fertility, during which time many monstrous and marvelous generations were brought forth, the Earth Mother became at last exhausted and sterile and lost her power of producing man and the larger animals, still she retained enough vigor to bring forth (besides plants, that are presumed to be generated spontaneously) certain small creatures, such as flies, wasps, spiders, ants, scorpions and all other terrestrial and aerial insects. The schools both ancient and modern all agree in this, and constantly teach that the Earth has continued to produce these creatures and will produce them as long as she exists. They do not, however, agree as to the manner in which these insects are generated, nor how life is communicated to them; for they say that not only does the Earth possess

this occult power, but that it is possessed by all animals, living and dead, also by all things produced from the Earth, and finally by those which are about to decay and return to dust. Hence others have claimed putrefaction itself to be the all-potent cause of generation, and still others, natural heat.

An interesting statement reflecting the prevailing view is that of Alexander Ross, who, commenting on Sir Thomas Browne's doubt as to "whether mice may be bred by putrefaction," wrote:

> So may he doubt whether in cheese and timber worms are generated; or if beetles and wasps in cow dung; or if butterflies, locusts, grasshoppers, shell fish, snails, eels, and such like, be procreated of putrid matter, which is apt to receive the form of that creature to which it is by formative power disposed. To question this is to question reason, sense, and experience. If he doubts this let him go to Egypt, and there he will find the fields swarming with mice begot of the mud of Nylus, to the great calamity of the inhabitants.

It is evident from this that in the seventeenth century, if the conditions were propitious, the rod of Aaron no longer was considered necessary to bring forth plagues. Paracelsus was an extreme proponent of the theory of spontaneous generation and one of the most serious charges of his enemies was that he had attempted to create human beings.

Redi gives an interesting account of the origin of the view that bees are born in the decayed flesh of bulls, tracing it to statements of the early Greek writers, one of whom (Antigonus Carystius) says that in order to breed bees a whole bullock must be buried underground, allowing only the horns to protrude; these in due time being sawed off, out fly the bees. He quotes Thomas Monfet, who says that some bees are born in the flesh of bullocks but others are born in the flesh of lions and the latter are better, stronger and more courageous. Probably the lion fable originated from the story of Samson, who, it will be recalled, on the first of his several liaisons, killed a young lion and on returning later to his lady love saw the carcass and in it a swarm of bees with honey. It was this story that formed the origin of the famous riddle with which Samson confounded the Philistines: "Out of the eater came forth meat, and out of the strong came forth sweetness."

With all this authority of current opinion, supported by Aristotle and even the Bible, Redi was indeed courageous to disagree, and especially so since the difficulties of Galileo were so fresh in his memory. However, he expressed his strong disbelief that bees were generated in the carcasses of either bullock or lion, but as it would not do to disagree with the Bible, even if he might venture to differ from Aristotle, he explains away the Samson story. He says that although the bees were present in the lion's carcass, there is no reason for the conclusion that they were generated there; the Sacred Text does not state it. The Hebrew text says that he returned after "some days," which there is evidence to indicate meant after a year, and then it is probable that nothing was left but a bony skeleton, inside of which the bees might well have been at honey-making. It would require too much space to describe the experiments which are so simply and clearly set forth in Redi's book. His book is written in a most interesting and attractive style and is interspersed with numerous classical references and quotations. The writer does not even disdain to employ poetical quotations in order to elaborate or illustrate his statements. The descriptions of his experiments, however, are concise and clear. The gist of the experimental study is as follows: He killed three snakes and placed them in an open box to decay. Not long afterward he saw that they were covered with worms of a conical shape and apparently without legs (maggots). After they had consumed the meat they disappeared. To know what had become of them he repeated the experiment, but this time, when the meat was all consumed, he covered every exit from the box. On the nineteenth day some of the worms became quiet, appeared to shrink and gradually assumed a shape like an egg. He noticed that there was some difference in the appearance of these eggs (which we now call pupae) so he segregated them in glass vessels covered with paper. At the end of eight days the shells of the eggs in one vessel were broken and from each pupa there came forth a green fly; from the pupae of another variety in a second vessel there appeared on the fourteenth day large black flies, from the pupae of another kind, black flies striped with white, and so forth. He then took various kinds of dead animals: pigeon, capon, pieces of veal, sheep's heart, raw and cooked flesh of ox, deer, buffalo, lion, tiger, and so forth and repeated the experiment. In every case the result was the same and one or the other kind of fly developed, sometimes all kinds. Now he saw that besides the flies and the worms the meat was covered also with eggs from which the worms were hatched. He says: "Having considered these things, I began to believe that all worms found in meat were derived directly from the droppings of flies, and not from the putrefaction of the meat," especially as "before the meat grew wormy the flies had hovered over it, of the same kind as those later bred in it." But, he says: "Belief would be vain without the confirmation of experiment, hence in the middle of July I put a snake, some fish, some eels of the Arno, and a slice of milk-fed veal in four large, wide-mouthed flasks; having well covered and sealed them, I then filled the same number of flasks in the same way, only leaving these open."

He goes on to tell that in the closed flasks no worms developed even after many days, while in the open flasks the meat became wormy and flies were seen entering and leaving at will. These and similar experiments were repeated many times.

He now says:

> Although I thought I had proved that the flesh of dead animals could not engender worms unless the semina of live ones were deposited therein, still to remove all doubt, as the trial had been made with closed vessels into which the air could not penetrate or circulate, I wished to attempt a new experiment by putting meat and fish in a large vessel closed only with a fine Naples veil, that allowed the air to enter. For a further protection against flies, I placed the vessel in a frame covered with the same net. No worms ever developed in the meat, though many flies buzzed about and lighted on the outside of the net and deposited eggs there.

It is not necessary to remark on the great similarity between this crucial experiment and those performed over two hundred years later by Needham and by Pasteur which finally settled the problem concerning the spontaneous generation of microorganisms. It is evident that Redi could not discuss the spontaneous generation of bacteria and other microorganisms, their existence at that time was not even suspected. Redi, however, did extend his experiments to include bees, scorpions, spiders, and the worms popularly and erroneously believed to arise spontaneously in vegetables and decayed fruits, in wood and in trees.

Redi finally stated:

> Although content to be corrected by any one wiser than myself, if I should make erroneous statements, I shall express my belief that the Earth, after having brought forth the first plants and animals at the beginning by order of the Supreme and Omnipotent Creator, has never since produced any kind of plants or animals, either perfect or imperfect; and everything which we know in past or present time she has produced, came solely from true seeds of the plants and animals themselves, which thus, through means of their own, preserve their species.

As a hero worshipper I wish he might have stopped there. However, Redi was a true scientist and wanted to support his beliefs by experimental demonstration. The greatest mystery in the whole problem of generation was related to the occurrence of parasites living on or within plants or animals, and in the state of knowledge as it then existed it is no wonder that when Redi came to this problem he was unable to arrive at the true solution and lapsed into philosophical deductions entirely unworthy of the scientific mind which devised the beautiful experiments which I have just described. The sad thing is that he started out with the right hypothesis and made many observations, especially on the worms which appear within galls, in the hope of substantiating this hypothesis, but as he could not explain how the eggs could have been deposited within the galls, he concluded that he believed "that the efficient cause resided in the peculiar potency of that kind of soil or principle which creates the flowers and fruits of living plants, and is the same that produces the worms of these plants." He did not urge this as a wide generalization, however, and disagreed with Circher, that the mulberry tree produces the silkworm, and with Aristotle that cabbage produces caterpillars. Still he believed it was possible that there was some kind of tree that could engender caterpillars! "I do not affirm this, neither do I deny it." Every one might believe as he chose. Redi was also inclined to believe that certain animal parasites arose from the same vital force which is operative in the case of the worms arising in fruit and in galls. The nature of the parasites which are found in the head of sheep (apparently in the sinuses) caused him much trouble and apparently induced him to fall back on what amounts to spontaneous generation for certain parasites. He could not agree with Johann Sperling, however, that lice arise in this way, but he believed that they originate from the eggs of the females, fertilized by coition. While Redi, therefore, finally admitted that there might be some parasites arising by a process akin to spontaneous generation, we must agree that he went as far as he could with the facts that he was able to demonstrate experimentally.

The attempt has sometimes been made to take away from Redi the full credit and honor of first overthrowing the doctrine of spontaneous generation. Bigelow states that Giuseppe Aromatari as early as 1625 in his book, "De Rabia Contagiosa," insisted that "plants arise from the seed and likewise all animals are born from the egg." Very frequently it is asserted that Harvey antedated Redi in his work "Exercitationes de Generatione Animalium," published in 1651. Redi, himself, gives considerable attention to the views of Harvey, whom he calls "that great philosopher of our times, the immortal William Harvey." Huxley, after a very careful search of Harvey's work, concluded the most that appeared clear was that "Harvey believed all animals and plants to spring from what he terms a 'primordium vegetale,' a phrase which may now be rendered a vegetative germ—but that this must needs, in all cases, proceed from a living parent is no where expressly maintained by Harvey. On the other hand, he does more than once use language which is consistent only with a full belief in spontaneous or equivocal generation." Indeed Harvey's main concern is not with generation, in the physiological sense, at all, but with development, to which problem he made important contributions. According to Professor Brooks,[1] Harvey demonstrated the principle of epigenesis many years before Wolff (1759) and von Baer (1829). Brooks, who strongly urges the value of Harvey's work on embryology, admits that "what Harvey meant by 'Omne vivum ex ovo' has nothing to do with the words as we use them today. Harvey repudiates in most energetic language the opinion that the continuity of living matter is never broken." Huxley stated that "Harvey believed as implicitly as Aristotle did in the equivocal generation of the lower animals," but Brooks thinks that this statement is too sweeping, and that Harvey did not entirely accept the

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[1] Brooks, *Johns Hopkins Hosp. Bull.*, Balt., 1897, VIII, 167.

Aristotelian idea. Although in many places in his book Harvey assumes the reality of equivocal generation, Brooks thinks this concession was made merely "out of courtesy" to Aristotle! Attention should be called to Harvey's lament on the losses which he suffered during the civil war when his house was stripped. He says that more important than the loss of his furniture was the loss of many observations, "particularly on the generation of insects." Redi also generously refers to this loss and says: "Perhaps, however, he would have stated his opinion with greater clearness and precision if the notes which he collected on this subject had not been dispersed during the tumult of the civil war, to the deplorable loss of the republic of philosophy."

We may conclude that although, before the appearance of Redi's work, Aromatari and others expressed convictions opposed to the belief in spontaneous generation and although Harvey may have collected some evidence bearing on this problem, there can be little doubt that Redi was the first to bring experimental evidence to overthrow this theory. Just as Foster says that Harvey was not the *discoverer* of the circulation but that he *demonstrated* the circulation of the blood, so we may say that although others may have *doubted* the occurrence of spontaneous generation, Francesco Redi was the first to *demonstrate* the falsity of this doctrine. His dictum "omne vivum ex viva" expresses exactly what we mean by that today. Moreover, this was one of the first biological generalizations based on experiment, and Redi's experiments have a significance much greater than is indicated by the immediate knowledge gained, even by the overthrow of the doctrine of spontaneous generation. Galileo introduced the experimental method into the study of the physical sciences. Redi demonstrated that the experimental method was the most effective means of arriving at the truth concerning biological phenomena. As Huxley says: For Nature, like a witness, reveals her secrets when put to torture."

Redi's later scientific work consisted largely in the investigation of animal parasites, a study undoubtedly stimulated by his interest in spontaneous generation. In this work the method is chiefly descriptive and experiment plays a much less important rôle than in his previous work. Probably the most important result was his demonstration of the reproductive organs in the ascaris of man and his demonstration of ascaris eggs. These discoveries must have gone far in dispelling his remaining doubts that spontaneous generation ever occurs. The results were published in a work entitled "Osservazioni intorno agli animali viventi che si trovano negli animali viventi" (1684). Without referring in detail to this study of parasites it may be mentioned that Redi studied and described 108 different species belonging to the cestodes, trematodes, nematodes, acanthocephales, acarines and insects, and these were isolated from a great variety of animals, including the hare, dog, wolf, cat, various fish, lion and tiger, and from man. If a rare animal was captured or died in the menagerie, Redi was at once notified and he made a careful search for parasites. In his work on pediculi he states that he was unable to discover any pediculi on lions and tigers but naïvely says "the search for parasites on these animals is attended with considerable difficulty!" Redi discovered the liver fluke in sheep and it is stated that he was the first to describe a gregarine, though this is doubtful. His book forms a true comparative helminthology and Redi is considered by parasitologists the father of this science.

A very important discovery in which Redi played an important, though not the chief rôle, is the discovery of the itch mite (Acarus, or *Sarcoptes scabiei*). The discovery is reported in a letter, addressed to Redi in 1687 by Cosimo Bonomo, describing researches made in collaboration with the pharmacist, Cestoni, to whom the credit for this discovery is usually given. This study was inspired by Redi and was probably carried out under his direction. The parasite was described as it appeared under the miscroscope after it had been extirpated on the point of a needle. Both the male and female forms were described. Redi demonstrated the contagiousness of the disease and showed how it could be cured by red precipitate of mercury, but notwithstanding this clear description of the disease and its remedy it was not until 150 years later that the truth of these statements was accepted, and the belief in the spontaneous origin of the disease was given up.

Attention must now be given to another important aspect of this many-sided man: namely, his position in the field of letters. His interest in philology has already been mentioned. He was a prodigious letter writer and he corresponded with the most eminent literary and scientific men both in Italy and throughout Europe. Many of his letters are included in his collected works, of which several editions have appeared. That he is still read is shown by the fact that an edition of extracts from his works was published in 1925. Although among physicians and scientists Redi is best known for his work on spontaneous generation, he lives in the hearts of his countrymen as a poet. That he ranks among the greatest Italian poets can hardly be claimed. On the other hand, it is not for me to decide whether or not he is guiltless of the sin of mediocrity, which has been held to be more of a sin in poetry than in any other art. Chereau says in his anthology of the French poet-physicians, that the French cannot put forward any to compete with the leading poet physicians of other countries, and of these latter he mentions Francesco Redi first. Whatever be his merits or sins it seems that a poet who is still read by his countrymen after three centuries reflects some luster on the profession which he so successfully practiced. It is not impossible that the subject of his chief poem (that for which he is chiefly renowned) has contributed to some extent to its longevity. This poem is entitled "Bacco in Toscana" and is in praise of the various vintages of Tuscan wine. This was first published in 1685 and has appeared in very numerous editions. In 1825 Leigh Hunt translated it into English. In his dedication to his brother, Hunt says: "I cannot send you, as I could wish, a pipe of Tuscan wine, or a hamper of Tuscan sunshine, which is much the same thing; so in default of being able to do this I . . . send you . . . a translation of a Tuscan bacchanal." The poem is an imitation of the Greek dithrambic poems and is probably the best modern example of this kind of verse. It consists of a monologue by Bacchus, who, sojourning with Ariadne on the Tuscan hills, drinks of various vintages in succession and as he does so sings in praise of each. As he drinks he becomes more enthusiastic over each kind in succession and finally ends in a whirlwind of intoxicated delirium declaring: "Montepulciano's, the King of all Wine." The rhythm, the metaphor, the rapid flow of ideas, harmonize perfectly with the nature of the subject and one can well understand the affection of a wine-growing, wine-drinking and wine-loving people for this laudatory poem. The following are extracts from Hunt's translation:

BACCHUS IN TUSCANY

The conqueror of the East, the God of Wine,
Taking his rounds divine,
Pitch'd his blithe sojourn on the Tuscan hills;
And where the imperial seat
First feels the morning heat,
Lo, on the lawn, with May-time white and red,
He sat with Ariadne on a day,
And as he sang, and as he quaff'd away,
He kiss'd his charmer first, and thus he said:—
Dearest, if one's vital tide
Ran not with the grape's beside,
What would life be, (short of Cupid?)
Much too short, and far too stupid.
You see the beam here from the sky
That tips the goblet in mine eye:
Vines are nets that catch such food,
And turn them into sparkling blood.
Come then—in the beverage bold
Let's renew us and grow muscular;
And for those who're getting old,
Glasses get of size majuscular;

And in dancing and in feasting,
Quips, and cranks, and worlds of jesting,
Let us, with a laughing eye,
See the old boy Time go by,
Who with his eternal sums
Whirls his brains and wastes his thumbs.
Away with thinking! miles with care!
Hallo, you knaves! the goblets there.

Statue of Redi in the Portico degli Uffizi.

Of Chianti he sings:

True son of the earth is Chianti wine,
Born on the ground of a gypsy vine;
Born on the ground for sturdy souls,
And not the rank race of one of your poles.
Like a king,
In his conquering.
Chianti wine with his red flag goes
Down to my heart, and down to my toes:
He makes no noise, he beats no drums;
Yet pain and trouble fly as he comes.

The poem is filled with classical allusions and refers to contemporary men and events which Redi elaborates upon in 250 pages of notes—the poem itself occupies less than fifty pages. Redi's other poems consist of 112 sonnets, a number of poems to be set to music and some occasional verses dedicated to his friends. Three of the sonnets have been translated by Geoffrey Smith. His translation of one in which, Smith states, a bold metaphor is worked out in Shakespearean manner, is as follows:

Sonnet 50

Like as a ship runs on in pride and power,
Coursing the broad ways of the unfathomed sea,
Pregnant with lofty esperance to dower
A new world with her weight of treasury;
The stars smile on her and with friendly scour
The favouring floods sweep on her destiny;
The breeze shakes out her canvas like a flower
And lifts her on the waters dancingly—
Yet might some wanton boy's untimely stroke
Shatter her arsenal; soon is she gone,
And all her hopes consumed in fire and smoke.
Even thus the mad boy Cupid in his fun,
Inflamed my life and all my courses broke.
"Yet with how small a spark," quoth he, "twas done."

Redi is usually placed among the Arcadians, a group of poets who collected about the ex-Queen Christina of Sweden. This remarkable woman was a daughter of Gustavus Adolphus. She renounced her throne to live in Italy and act as a patron of letters and science. It was through her support that Borelli was at last able to complete and publish his book on animal motion ("De motti animalium," 1680–1681). A collection of sixty of Redi's sonnets was published in 1703 and a beautiful edition de luxe embellished with numerous and beautiful copper engravings was made by Prince Ferdinand.

Redi's portrait was painted by Sustermans, and a number of engravings were made from this. There is also one other portrait apparently of no great value, by an unknown painter. A statue of Redi stands in the gallery of the Uffizi. It is very appropriate that this statue of Redi should stand here for it is to Redi that we owe the wonderful Uffizi collection of marbles. The story is that Cosimo, being frequently ill from overeating and drinking, was advised by Redi to take regular walking exercise. He decided to follow this advice by walking regularly in the great corridor of the Uffizi, and to amuse himself during this time of exercise he decided to assemble here all the marbles belonging to the Medici. He thus collected here all the wonderful statues, which, until then, were scattered about, many being in the Villa Medici in Rome. In 1677 a medal by Soldanus was struck in order to show the esteem in which Redi was held by his contemporaries, and in 1684 Cosimo III had three bronze medals made to perpetuate the memory of Redi as Philosopher, Physician and Poet.

During his life Redi was made a member of all the great literary societies of Italy and before his death he was elected Arch-Counsel of the Accademia della Crusca, the highest office in that illustrious society. Redi therefore received during his life all the honor that could be bestowed upon a man of genius. His last years, however, were full of sadness for he was subject to attacks which his biographers call epilepsy, but the exact nature of which is not clear. The condition may have been angina pectoris. Probably, chiefly on account of his poem in praise of wine, Redi has obtained a reputation as an epicure and profligate. While not entirely lacking in appreciation of earthly joys it seems that Redi, at least in his later life, was temperate and even abstemious. He was never married and apparently in his later years was the mainstay of the family, his brothers accomplishing little but causing him trouble. One of his brothers was married and had a family, but Redi supported the family and adopted the children. One of these children, Gregoire, was later made his heir, and he inherited not only the Villa Redi near Arezzo but also the considerable fortune which had been accumulated by Francesco. In spite of his illness Redi kept on working, though apparently constantly in fear of an attack. He died suddenly during the night (February 28–March 1, 1697) at Pisa, whither he had gone with the Court. The body was carried to Arezzo, and placed in the church of San Francesco. A suitable tomb was later erected by his nephew and heir, Gregoire. On the tomb are simply the words: "Francisco Redio Patricio Aretino Gregoriis Fratris Filius" as if to indicate that his name was so glorious that posterity would require no eulogy.

FRANCESCO REDI.
J. E. Mansfeld inv. et fec.

BOOKPLATE OF FRANCESCO REDI.

SOME MEDICAL MEDALS AND TOKENS

TO BE PRESENTED TO THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

By E. B. KRUMBHAAR, M.D., PH.D.

PHILADELPHIA, PA.

MEDICAL medals, jetons and tokens form a valuable first-hand imperishable record of the medicine of their time and in addition frequently display an artistic excellence which should make them desirable objects of the private and institutional collector's zeal. Certainly in a society, such as the College of Physicians of Philadelphia, a worthy collection of medical medals would be a most fitting adjunct, and yet today we are the proud possessors of but thirty-seven, exhibited with other trinkets in the Periodical Room!

Except for an article by Allemann[1] in the first volume of the Annals of Medical History and several by Dr. Horatio Storer[2] of Newport, written in the eighties and nineties and early years of this century, there seems to have been surprisingly little written about medical numismatics in English. Dr. Storer gives details of over two thousand medals ranging from antiquity to modern times, and his descriptions are especially valuable for those American and Canadian medals and tokens which have not been included in foreign works. He also speaks of the only other American collections that he knows of, those of Drs. William Lee of Washington and George J. Fisher of Sing Sing. It would be interesting to know where these collections now are. In this city he mentions having received help in his researches from the Messrs. Chapman, members of a still existing firm interested in the *American Journal of Numismatics*, not the distinguished Philadelphia doctors of that name.

For the description of even the few medals which it is my privilege to present to the College collection, it is desirable to retain Dr. Storer's classification: A. Personal medals (whether connected with schools, hospitals, societies or other organizations, or events such as epidemics). B. Medals of colleges, hospitals and medical societies. C. Medals commemorative of medical events. D. Medals related to epidemic disease. E. Medico-ecclesiastical medals. F. Tokens of pharmacists, dentists and "irregular" practitioners.

As is usual, the first group is the most numerous, constituting sixteen out of the thirty-five of this series:

1. The oldest, a silver medal, 3 mm., in honor of Conrad Gesner, bears on the obverse CONRADUS GESSNERUS, M.D., with portrait bust in profile (l), in hat and costume of the period. Reverse: A quartered coat of arms and crest with the words "ARCHIAT. PROF. PHYS. TIGURIN" about the periphery and "MUNIFIC. AUG., 1564."

Although struck at Augsburg, this medal presumably commemorated his call to the Chair of Natural History at Zürich in 1564.

Conrad Gesner (1516–1565), well known to us all from Cuvier's appellation of "the German Pliny," was a man of tremendous erudition and, in spite of a busy practice, a prolific writer on zoology, botany and bibliography. He died of the plague after an illness of four days, according to Haller, though Costalus relates that his death was due to his scientific zeal in testing on himself the effects of the drug Doronicum.

2. Ambroise Paré. Ae. 40 mm. Obverse: Portrait bust in profile (r) in costume of the period, with the words: "AMBROISE PARÉ-DEPAULIS, F." Reverse: "NÉ/A LAVAL/EN M.D. IX.//MORT//En M.D. X.C.//GALERIE METALLIQUE//DES GRANDS HOMMES FRANCAIS//. 1819."

An excellently executed example of early nineteenth century work, copied from the traditional portrait of this great man. As the inscription states, it is one of a series of medallic publications, popular at that period. The facial wrinkles and sclerotic temporal artery of old age are of medical interest.

3. Sbaralea and Malpighi: Ae, 36 mm. Obverse: "10. HIERONYMUS SBARALEA-DOC. COLLEG. ET BONON ANAT. LECT. EMERIT" about the periphery, with portrait bust in profile (r). Reverse: "MARCELLUS MALPIGHIUS, BONON. PHIL ET MED. COLLEGE. S.V."

Gian Girolamo Sbaraglia[3] was born in Bologna, October 28, 1641, and died there in 1710 at the age of sixty-eight years, seven months and ten days. He was buried in the Church of the Santissima Annunziata outside of the Porta Procola, and there is said to be a life-sized statue of him in the halls of the University. He was a successor of Malpighi in the Chair of Anatomy at Bologna; but his association with his famous predecessor on the same medal is rather unexpected, as he was one of Malpighi's chief and most determined opponents. As to the celebrated father of histology it must be admitted that the likeness on the medal has very little in common with the better known portrait by Tabor at the Royal Society. His achievements are matters of common knowledge.

4. Frederick Hoffmann: Ae, 40 mm. Obverse: Portrait bust in profile (l) in wig and costume of the period, with the words: "FREDERICUS HOFFMANNUS. WOLF. F." Reverse: "NATUS//HALAE //in MAGDEBURGICA//An. M. DC. LX.//OBIIT//AN. M. DCC. XLII//. SERIES NUMISMATICA// UNIVERSALIS VIRORUM ILLUSTRIUM//. M D CCCXXIII//. DURAND EDITIT." Stamped on the edge the word "Monachii."

Friedrich Hoffmann (1660–1742), professor of Anatomy and Surgery at Halle, an iatromechanist with a tonic and atonic theory of disease, acquired great reputation as an epidemiologist. One of the first to describe rubella (1740), he also gave good descriptions of chlorosis ("De genuina chlorosis indole," 1730), typhus epidemics, and revived the use of mineral baths. Although he wrote on medical ethics ("Medicus politicus," 1738) he did not hesitate with other eighteenth century physicians to sell drugs compounded from secret formulas. According to Sir Clifford Allbutt he was the first to perceive that "pathology is an aspect of physiology" (i.e., functional pathology).

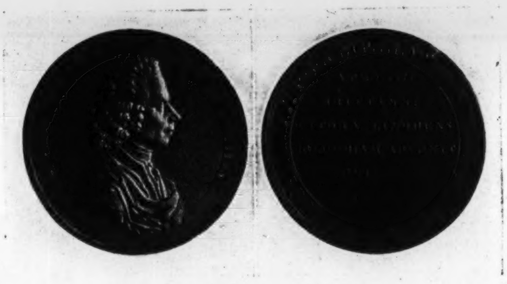
Malpighi-Sbaraglia, Obverse and Reverse.

5. Boerhaave: Ae, 40 mm. Obverse: Portrait bust in profile (l), with the words: "HERMANNUS BOERHAAVE. VIVIER F." Reverse: "NATUS//VOOZONTI// PROPE LEIDAM//IN HOLLANDIA//. AN M. DC. LXVIII//OBIIT//AN. M DCC. XXXVIII.// SERIES NUMISMATICA UNIVERSALIS VIRORUM ILLUSTRIUM. M.D.CCC.XIX//DURAND EDITIT." Stamped on the edge "Monachii."

A good portrait of the "Batavian Hippocrates" from the same series as the preceding.

6. Mead: Ae, 40 mm. Obverse: "RICHARDUS MEAD, MED. REG. ET F.R.S. L. PINGO F," with portrait bust in profile (l). Reverse: The infant Hercules (?) strangling the serpent, with a crescent moon and a blazing sun. Beneath is a coat of arms, presumably Mead's. "LABOR EST ANGUES SUPERARE, N.AV. XI, MDCL XXIII//O.F. XVI, MDCCLIV." (See No. 388 Medallic illustrations of the history of Great Britain and Ireland.)

In 1704 Mead published an article on the influence of the sun and moon on health, which explains their appearance on this medal. The medal is undated but probably is the one struck by Lewis Pingo in 1773. The reason for the motto I have been unable to discover. Certainly the customary picture of this well-known man does not make it seem especially appropriate. As Dr. Johnson said: "Dr. Mead lived more in the broad sunshine of life than almost any man." Fostered by the elderly John Radcliffe, from whom he inherited the famous gold-headed cane, he was considered to be the most prosperous practitioner of a prosperous time. Garrison states that his average income was between £5,000 and £6,000 a year, when the pound had a purchasing power of more than three times its present value, and his open house and splendid collection of books, paintings and medals are matters of history.



PRIESTLEY, OBVERSE AND REVERSE.

7. **HALLER.** Ae, 40 mm. Obverse: Portrait bust in profile (r) in modernized (?) costume, with the words "ALBERTUS HALLER. CAQUE F." Reverse: "NATUS BERNAE // IN HELVETIA // AN M. DCC.VIII // OBIIT // AN. M. DCC. LXXVII //. SERIES NUMISMATICA // UNIVERSALIS VIRORUM ILLUSTRIUM // M.D.CCCXXI." Albrecht von Haller (1708–1777), "the master physiologist of his time" (Garrison) needs no apologia in these pages. Garrison, Kronecker ("Haller Redivivus") and many others have amply testified to the value of his contributions and his truly remarkable versatility. The present portrait is much more sympathetic than Studer's pompous oil painting.

8. **LAVATER:** Ae, 40 mm. Obverse: "JOH. GASPARUS LAVATER" with portrait bust in profile (r). Reverse: "NATUS // TURIC // HELVETIORUM // AN. M.DCC.XLI // OBIIT // AN.M.D. CCC. I. SERIES NUMISMATICA // UNIVERSALIS VIRORUM ILLUSTRIUM // M.D.CCC.XVIII PARISIS. DURAND. EDIDIT."

Johann Caspar Lavater (1741–1801), the celebrated physiognomist, published his famous "Von der Physiognomik" in 1772. Surpassing the phrenologists, Lavater extended his observations to the whole body, and who today dare say what may and may not properly be deduced from such studies. Certainly we all make daily use of our own deductions, based on far less scientific evidence, and the recent work of the Constitutional Clinic of the Presbyterian Hospital of New York indicates the return swing of the pendulum in this field. The nature of this medal, as one of a series commemorating celebrated personages, is sufficiently indicated in the inscription and testifies to the greater popularity of this form of art in the early half of the nineteenth century, especially in France where, to be sure, the beautiful medals of the late war show that the fondness for this form of art is by no means extinct.

9. **PRIESTLEY:** Ae, 53 mm. Obverse: "JOSEPHUS PRIESTLEY. PHIPSON, F." with portrait bust in profile (l). Reverse: "APR. VIII // BRITANNIAE // LITORA LINQUENS // COLUMBIAM ADVENIT // JUNII IV // MDCCXCIV" and about the periphery: "I DECUS I NOSTRUM MELIORIBUS UTERE FATIS."

This medal is of particular interest to Pennsylvanians, as it signalizes Priestley's departure from England to spend the rest of his days at Northumberland, Pennsylvania, in a home which State College has recently perpetuated as a Priestley Museum. It will be recalled that on account of his unconventional religious beliefs, the distinguished discoverer of oxygen was thought to be attempting to bring about a revolution in England similar to the French Revolution. On July 14, 1791, when he and his friends had assembled "to celebrate the emancipation of a neighboring nation from tyranny, without intimating a desire of anything more than an improvement in their own constitution," his house was burned down by a Birmingham mob, invaluable "philosophical" apparatus destroyed and his life put in danger. Although he continued another three years in England, he finally decided to come to the United States in the hope of finding there "that Protection from Violence, which Laws and Government promise in all countries, but which he has not found in his own." That he was not without sympathizers at home, this medal testifies.

BENJAMIN RUSH, OBVERSE AND REVERSE.

10. BENJAMIN RUSH: Ae, 41 mm. Obverse: Portrait bust in profile (l) in civilian costume with wig, with the inscription about the periphery: "BENJAMIN RUSH, M.D. OF PHILADELPHIA." Reverse: A landscape with a tree in right foreground, against which leans an open book standing on a tablet marked "READ, THINK, OBSERVE." Beneath the words "M. FURST. A. MDCCCVIII," and above the word "SYDENHAM."

This distinguished man (1745–1813) needs no introduction to American readers. His well-known aquiline profile is given a different appearance in this medal than in Sully's and Savage's portraits, but well typifies his energetic, shrewd and even contentious nature. The reverse is a well-executed picture of the Schuylkill river and its junction with the Delaware. The word Sydenham refers to the name of Rush's home on the Schuylkill, not to Lettsom's appellation, "the American Sydenham." The legend on the reverse is from the close of his lecture, "On the Causes Which Have Retarded the Progress of Medicine." I have not been able to learn the occasion for striking this medal in 1808 nor did Dr. Storer,[4] after considerable search in the local libraries, the United States Mint and local jewellers.

SOEMMERRING, OBVERSE AND REVERSE.

The medal was signed by M. Furst, an assistant engraver of the U. S. Mint at the time, and is said by Henry Chapman to have been struck by Jacob Reich, the die sinker who worked for Joseph Sansom (of Sansom Street fame), who also prepared well-known medals of Washington and Franklin. Dr. Storer possessed the medal both in this form, in lead and with a variant reverse, and states that both forms are in the Lee Collection, now in the Surgeon-General's office. It has, nevertheless, always been considered of great rarity. It is of interest that it was struck during the period in which Rush was treasurer of the United States Mint.

11. SOEMMERRING: Ae, 50 mm. Obverse: "S.TH.A. SOEMMERRING NAT. THORUNI D. XXVIII IAN. MDCCLV DOCT. CREAT. GOTTINGAE D. VII APR. MDCCLXXVIII" about the periphery, with portrait bust (l) and a small caduceus with a single serpent. "G. LOOS

DIR. C. PFEUFFER FEC." Reverse: "*ANATOMICORUM PRINCIPI ANIMAE ORGANA QUI APERUIT ARTIS VIRIQUE CULTORES. D. VII APR. MDCCCXXVIII*" about the periphery, with a base of the brain, medulla and cerebellum in bas-relief. This is executed in such accurate detail that not only the various lobes can be made out, but all the cranial nerves, the corpora quadrigemina and the stalk of the pituitary are clearly indicated.

A. B.
A, Cuvier. B, Humboldt.

A follower of the anatomist Albinus, Soemmerring (1755–1830) strove for an equal perfection in his work and illustrations. The bas-relief on this medal refers to his graduating thesis on "De basi encephali et originibus nervorum cranio egredientium," which introduced a classification of the cranial nerves that superseded that of Willis. His chef d'oeuvre, " Vom Baue des menschlichen Körpers," was published at Frankfurt, 1791–1796.

This medal was struck to celebrate the fiftieth year of his doctorate, on April 7, 1828, at which time the savants from all Germany gathered to do him honor. "Doellinger and Martius, in the name of the Academy of Munich, Meckel for Halle, Baer and Bardach for Konigsberg and Tiedemann for Heidelberg and still others, each offered an original memoir to him whom they honored as their master" (Dezeimeris).

12. **Cuvier**: Ae, 67 mm. Obverse: "GEORGES CUVIER. NÉ À MONT BELIARD EN 1769—MORT A PARIS EN 1832. A. BOVY 1834," about the periphery, with portrait bust in profile (r) in court dress in high relief. Reverse: "DISCOURS // SUR LES RÉVOLUT. // DU GLOBE. //. RECHERCHES SUR LES// OSSEMENTS FOSSILES.// ANATOMIE COMPARÉE. // REGNE ANIMAL.// HIST. DES SCIENCES // NATURELLES. // &.&.& //," occupying the center. "PAIR DE FRANCE CONSEILLER D'ETAT ET AU CONSEIL ROYAL D' INSTR. PUBL. SECRETAIRE PERP. DE L'ACADEMIE DES SCIENCES. L'UN DES 40 DE L'ACAD. FR ACADN. LIB. DE L'ACAD. DES BELL. LETT. PROF. AU COLL. D. FR. ET AV. MUS. D. HIST. NATURELLE &.&." in two rows about the periphery.

This medal was apparently struck to commemorate the death of this distinguished naturalist and comparative anatomist, the founder of vertebrate paleontology.

13. **Hahnemann**: Ae, 40 mm. Obverse: "SAMUEL HAHNEMANN NATUS MISENAE D.X. APRILIS MDCCLV DOCTOR CREAT. ERLANGAE D.X. AUGUSTI MDCCLXXIX" with portrait bust in profile (r). Reverse: "SIMILIA SIMILIBUS," in center; "MEDICINAE HOMOEOPATHICAE AUCTORE DISCIPULI ET AMICI D.X. AUGUSTI MDCCCXXIX."

Samuel Christian Friedrich Hahnemann was born in Meissen, 1755, took his degree at Erlangen in 1779, published his new doctrine in the "Organon Der Rationellen Heilkunde" in 1810 and died in 1843. Again it is to be presumed, that as in the case of Soemmerring, this medal was struck in 1829 in honor of the fiftieth year of his doctorate.

14. **Vleminckx**: Ae, 62 mm. Obverse: Portrait bust in profile (r), with the following words about the periphery: "J. F. VLEMINCKX INSPECT$^{\text{EUR}}$ GEN$^{\text{AL}}$. DU SERVICE DE SANTÉ DEL'ARMÉE BELGE. LEOPOLD WIENER (FEC.)."

Reverse: (In the center) "A L'ORGANISATEUR // HABILE, // A L'ADMINISTRATEUR // INTÈGRE, // AU CHEF DÉVOUÉ // LES OFFICIERS DU // SERVICE SANITAIRE // 1853." A conventional open wreath surrounding, and at the top a snake entwined about an object that resembles a long-handled mirror.

Although it has not been possible to trace this gentleman further than in his connection with the Belgian sanitary service the medal is obviously the gift of admiring subordinates to their chief on his retiring from office.

15. **HUMBOLDT**: Ae, 41 mm. Obverse: Portrait head in profile (r) as a young man, with the words about the periphery: "ALEXANDER AB HUMBOLDT NAT. XIV SEPT. MDCCLXIX." Reverse: "FLORA SUBT. // IRRIT. VEG. ET AN. // ITER AMERIC. // GEOGR. PLANT. // DISQ. GEOL. ET // MAGN. // LIN. ISOTH. // G. LOOS DIR." Surrounded by a heavy closed wreath.

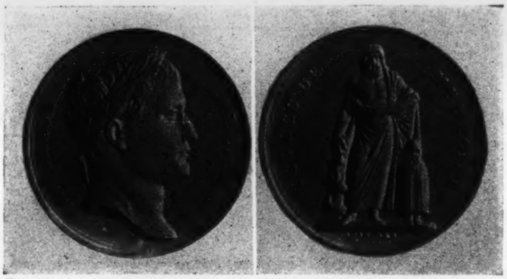
16. **HUMBOLDT**: Ae, plaquette, 39 by 50 mm. Obverse. Three-quarters portrait bust (l), as an elderly man in civilian clothes of the period in an oval; surmounted by a draped rope of ivy, above which are the dates, 1769–1859. Below the lettering: "A. L. v. HUMBOLDT."

Friedrich Heinrich Alexander Freiherr von Humboldt, though perhaps more of a traveler and a naturalist than a medical man, needs no apology for inclusion in this group on account of his work on galvanism and muscle physiology.

In Group B (Medical Colleges, Hospitals and Societies) there are eight representatives:

17. **PHARMACEUTICAL SOCIETY OF PARIS**: Octagonal, Ag, 30 mm. Obverse: Female head in profile (l) with fillet. A small sacred snake eating from a bowl at the left; a sprig of poppy at the right, with the words: "HYGIA [sic] SALUS BARRE F." Reverse: A snake encircling a column on which stands a bird, with a retort and a vase of flowers at the sides. About the periphery the words: "SOCIETAS PHARMACEUTICA PARISIENSIS. MDCCXCVI."

18. **ÉCOLES DE MÉDECINE**: Ae, 40 mm. Obverse: Profile portrait head of Napoleon with laurel wreath, and the words "NAPOLEON EMP. ET ROI. ANDRIEV. F. DENON DIRT." Reverse: Aesculapius, with his snake entwined about a tree trunk and the child, Telesphorus, with the words "ÉCOLES DE MEDECINE" about the periphery and at the bottom: "DENON DIREX JOUANNIN."



ÉCOLES DE MÉDECINE, NAPOLEONIC, OBVERSE AND REVERSE.

A Napoleonic medal struck sometime between the years 1803 and 1815 for the use of the medical schools of the University of Paris.

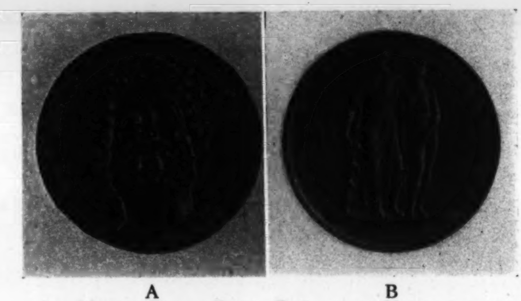
19. **AU SOULAGEMENT DE L'HUMANITÉ**: Ae, 38 mm. Obverse: A snake coiled about a retort which leans against a bush and some rocks. About the periphery are the words: "AU SOULAGEMENT DE L'HUMANITÉ." Reverse: A closed wreath.

Beyond the fact that it is obviously medical, this medal offers little by way of identification. From Bramsen[5] and Millin[6] we learn that it is a Napoleonic Medal struck in 1803.

20. **INTERNATIONAL MEDICAL CONGRESS, 1881**: Ae, 76 mm. Obverse: Crowned portrait bust of Queen Victoria (r) with the words about the periphery: "VICTORIA QUEEN OF GREAT BRITAIN AND IRELAND: EMPRESS OF INDIA." Reverse: Standing figure of Aesculapius with rod and twined serpent and a group of sick and wounded. In the background the earth and a defeated, shrouded figure of

death. About the periphery the words: "INTERNATIONAL MEDICAL CONGRESS, LONDON. JAMES PAGET, PRES., WILLIAM MAC CORMAC, HON. SEC. GEN. 1881. J. TENNIEL DEL WOYN F."

21. University of Pennsylvania Medical Alumni Society: Ae, 50 mm. Obverse: A Scotch thistle with the words about the periphery: "MEDAL OF THE ALUMNI SOCIETY OF THE MEDICAL DEPARTMENT OF THE UNIVERSITY OF PENNSYLVANIA." Reverse: Aesculapius' rod and snake, within an open wreath. In this example the reverse is stamped askew from the obverse.



A. Mary Ellis Bell Prize for Undergraduate Medical Research.
B. Vaccination Medal.

This medal and a prize of $50.00 is offered annually by the Society for the member of the graduating class who has attained the highest general average in examinations.

22. Gold Medal of the Royal Society of Medicine: Bronze replica, 44 mm. Obverse: Hygiea, the daughter of Aesculapius, with snake entwined on left arm, bestowing a wreath upon Research, a kneeling male figure with the lamp of knowledge in his right hand. About the periphery the words, "AUSPICIIS SOCIETATIS REGIAE MEDICINAE. NON EST VIVERE SED VALERE VITA. E C R P"; and above the kneeling figure the words "INSTITUTAE MDCCCV." Reverse: Cheiron the Centaur teaching the young Aesculapius the art of healing. They stand before a spring, the boy holding plants in his right hand, with a coiled snake between the Centaur's legs. Above a bow with five arrows and the words "FINIS CORONAT OPUS."

This medal is awarded by the Society triennally for valuable contributions to the science and art of medicine. It was established through the generosity of the late Dr. Robert Murray Leslie and has been given thus far to Sir Almroth Wright in 1920 and Sir Gowland Hopkins in 1923.

23. Centenary of French Academy of Medicine: Ae, 67 mm. Obverse: The goddess Hygiea (representing the Academy) seated in a library, and surrounded by various medical instruments and a snake drinking from a cup. About the periphery the words: "CENTENAIRE DE L'ACADEMIE DE MEDECINE, 1820–1920. PAUL RICHER." Reverse: The same figure standing in the same surroundings looking into the future, where large factories are dimly visible, with the date "1920–. . . . ."

A medal struck in honor of the occasion, but with apparently unlimited distribution.

Accompanying this medal is a handsome volume, richly illustrated, giving the history of the Academy and the influence that it has had on French medicine, surgery and sanitation in the past century, a lesson from which similar institutions in this country would seem to have much to learn!

24. Mary Ellis Bell Prize for Undergraduate Medical Research: Ae, 126 mm. Obverse: Full face portrait head of Aesculapius, with the words "IHTHΣEΩΣ ENEKA" and the monogram "RTM '23," finished in antique green. Reverse: "MARY ELLIS BELL // PRIZE FOR // UNDERGRADUATE MEDICAL RESEARCH// WON BY //" engraved on a polished surface.

This medallion, modelled by R. Tait McKenzie after the marble bust of Aesculapius in the British Museum,* bears the motto: "On account of (or in reward for) zealous research" (in ancient Attic script). It is cast direct from the form, after the manner of the Renaissance medals of Italy. It is awarded annually by a committee of the medical faculty of the University of Pennsylvania to the student or students who have performed the best piece of undergraduate medical research during the previous year, together with a $20.00 premium. The award is made at the annual meeting of the Undergraduate Medical Association. In 1923 it was won by Messrs. John B. Barnwell and Ralph Lynch; in 1924 by E. M. Landis and four associates; in 1925 and 1926 by E. M. Landis again.

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* Garrison, F. H. History of Medicine. Ed. 3, Phila., 1921, p. 76.

Group C (medals commemorative of medical events) has but two representatives in this series:

25. Fair for U. S. Sanitary Commission: Ae, 57 mm. Obverse: An angel with a cup and horn of plenty ministering to two sick soldiers in a tent. About the periphery the words: "WE GIVE OUR WEALTH FOR THOSE WHO GIVE THEIR HEALTH FOR US. SCHUSSELE. INV. PAQUIT F." Reverse: "IN COMMEMORATION// OF THE// GREAT CENTRAL FAIR //FOR THE //U. S. SANITARY COMMISSION // HELD AT // PHILADELPHIA // JUNE 1864."

This fair,[7] which lasted several weeks, covered the entire space of Logan Square, enclosing the trees of the square with watertight compartments. It was the largest affair of its kind held during the Civil War anywhere in the country and was a great financial success. It is said to have cleared three or four million dollars, a very large sum in those days. A small daily paper was published in connection with it. Dr. W. W. Keen, who gave me the above information, was one of the medical aides.

26. Vaccination Medal: Ae, 40 mm. Obverse: Portrait head of Napoleon crowned with a laurel wreath and the words "NAPOLEON EMP. ET ROI." Reverse: Standing figures of Aesculapius and Hygiea; to one side a diminutive cow, to the other a vaccinating scalpel of the period. Beneath, the words "LA VACCINE MDCCCIV. ANDRIEU F. DENON DIR."

Jenner's publication of his discovery of vaccination in 1798 was quickly followed by the spread of the method through the civilized world. It was introduced rather generally through Europe in the next year; in America by Waterhouse in 1800, and had even reached Mexico and India by 1802. Colon, Pinel and Thouret were influential in bringing about its adoption in France and by 1801 (the most prolific year in French vaccination literature) Colon was already writing about the history of the introduction and progress of vaccination in France. It is not surprising, then, that on Napoleon's assumption of the imperial crown, his paternalistic government should have had a medal struck, as he did for other state activities, to promote the use of a sanitary procedure of such immense importance. The small instrument for performing the vaccination is identical with several instruments of the period now preserved in the Wellcome Historical Museum.

Of Group D (medals related to epidemic diseases) there is but one representative:

27. Cholera Epidemic: Lead, 83 mm. Obverse: A symbolic group of Aesculapius holding the wrist of a reclining sick woman, while with the other hand he repels a figure of Death (as a skeleton with bat's wings and a scythe) who holds a dying man. Three adults and two children complete the group. "INVASION DU CHOLERA EN 1832." Reverse: A wreath.

This was a Viennese medal by F. Rogat struck on account of the cholera epidemic which raged from 1831 to 1837.[8] From the date of the medal, it is obvious that it was not struck to commemorate recovery from the epidemic.

In Group F (tokens) there are two public and one private hospitals, two mid-wives, two quacks (type unspecified), one pharmacist and one remedy:

28. Starkey Myddelton: Cu, 38 mm. Obverse: Two infants standing on a platform. "STARKEY: MYDDELTON: MAN MIDWIFE: LONDON, 1724." Reverse:

Myddelton's shield and crest, with motto "SPES IN DEO." (Worn.)

This is described by Hunter as "extremely rare" and "probably a sort of advertising ticket." Myddelton was the second son of Henry, the fourth son of Sir Hugh Myddelton, born April 3, 1688, who practiced physic in London.

29. Burchell's Worm Token: Cu, 27 mm., pierced. Obverse: "BASIL BURCHELL NO. 79 LONGACRE. SOLE PROPRIETOR OF THE FAMOUS SUGAR PLUMBS [sic] FOR WORMS." Reverse: "BASIL BURCHELL SOLE PROPRIETOR OF THE ANODYNE NECKLACE FOR CHILDREN CUTTING TEETH."

30. Dr. Stuart's Midwifery Token: Cu, 10 mm. Obverse: Two seated figures. "PRIVATE MEDICAL ESTABLISHMENT, 1841." Reverse: Kneeling figure of a woman nursing a baby. "DR. STUART, 30 MAXWELL STREET GLASGOW. MIDWIFERY AND SURGERY."

31. Montrose Lunatic Hospital: Cu, 28 mm. Obverse: Picture of the building, dated 1781, with words: "MONTROSE LUNATIC HOSPITAL. ERECTED BY SUBSCRIPTION," about the periphery. Reverse: (Turned, i.e. coin fashion.) Coat of arms (effaced), with two pelicans, supporting, and crest of a pelican feeding its young. Motto (effaced). Date 1799.

32. Dundee Infirmary. Cu, 27 mm. Obverse. Picture of building sunk in oval. "DUNDEE HALF PENNY 1796. INFIRMARY FOUNDED 1791. I W. I. DESIGN" (This is partly effaced by wear). Reverse: A ship at dock and harbor scene in a sunken demilune, and beneath a coat-of-arms in a sunken oval, with the words: "DEI DONUM." About the periphery: "MARE ET COMMERCIUM MUS" (partly effaced).

33. Baron Spolasso: Advertising Token. Brass, 22 mm. Obverse: Full face portrait with the words about the periphery: "THE BARON SPOLASSO M.D. & C. THE REAL FRIEND OF THE AFFLICTED." Reverse: "JANY 22d,'1838. THIS // EMINENT // PHYSICIAN'S // 5,000 RECENT // ASTOUNDING CURES // AND HIS NARRATIVE // OF THE KILLARNY // IMMORTALIZE HIS NAME //. SWANSEA STH WALES" (Milled edge). Like most tokens this speaks for itself in more senses than one.

34. Private Medical Establishment. Cu, 21 mm. Obverse: Mother nursing child. About the raised periphery: "PRIVATE MEDICAL ESTABLISHMENT. 1841." Reverse: A doctor and patient seated. "HONOUR 1841." About the periphery: "PRIVATE MEDICAL ESTABLISHMENT."

35. Dr. Eady's Advertising Token. Cu, 13 mm. Obverse: "HEALTH RESTORED," with a phoenix rising from the flames. Reverse: "Dr. Eady, 38 DEAN STREET SOHO," enclosed in a wreath.

36. Ferro Malesci. Medicine Advertisement. White metal, 33 mm. Obverse: Coat of arms, with words on shield: "LABOR ET INGENIUM. C.C.M. MARCA DEPOSITA" and about the periphery: "FERRO MALESCI 2500 CERTIFICATI MEDICI 2500. 12 per cent FERRO CHIMICAMENTE PURO." Reverse: "FERRO MALESCI // INDICATO // DAI SIGNORI // MEDICI IL MIGLIORE // RICOSTITUENTE // DEPURATIVO DEL SANGUE // SI VENDE IN TUTTE // LE FARMACIE // DUE MILA CINQUECENTO // ATTESTI // MEDICI."

An advertising token of an Italian patent medicine of unknown date (recent), indicating that these methods do not vary greatly in many countries.

These ordinary examples of a relatively common form of token have been sufficiently discussed elsewhere to require no further comment here.

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REMARKS ON THE PRESENTATION OF MICROSCOPICAL PREPARATIONS MADE FROM SOME OF THE ORIGINAL TISSUE DESCRIBED BY THOMAS HODGKIN, 1832

By HERBERT FOX, M.D.

PHILADELPHIA, PA.

ON a recent visit to Guy's Hospital in London, I made an attempt to find some of the original material used by Thomas Hodgkin when describing the disease that goes by his name. I was at first unable to do so because there is nothing classified under the name of Hodgkin, and I could not identify satisfactorily the numbers given by Sir Samuel Wilks in his article of 1865. By consultation with Mr. Burne, Curator of the Museum of the Royal College of Surgeons, and Dr. Beadle, Curator for Pathology, I was informed that one of Hodgkin's original cases was in Guy's Museum, No. 1523, under the name of Dr. Richard Bright. This specimen can be very well identified with Hodgkin's Case No. II, which came from Bright's service. Through the kindness of Dr. Adrian Stokes, professor of pathology, and Mr. Davies-Colley, curator of Guy's Museum, I was enabled to examine this specimen and to obtain a piece of it for histological study. This number does not correspond with any number given in Wilks' article[1] but the description to follow is in almost identical words in this paper, in Hodgkin's paper[2] and in the present issue of Guy's Museum Catalogue. Dr. Stokes and Mr. Davies-Colley have been good enough to recheck for me the numbers and specimens in the catalogue used in 1865, the numbers mentioned by Wilks and the numbers and specimens as they exist today in the catalogue and museum. They confirm my findings that, in so far as the specimen 1523 is concerned, there can be no reasonable doubt that it is the original tissue studied and reported upon by Hodgkin. These gentlemen have gone further and have been able to identify the present specimen 4768, as corresponding to 1541 (12) of Wilks' report, as other glands from Case No. II, Ellenborough, in Dr. Bright's service in 1828. Dr. Stokes and Mr. Davies-Colley have given me pieces from this tissue and also two other pieces from tissue studied by Hodgkin. These are from Case IV, that of Thomas Wescott, 1830, under Addison's care, and from Case VI, Thomas Black, 1830, in Bright's ward. They are numbered now in the Museum as 4769 and 4770 respectively.

HODGKIN'S CASE II

This case was that of a lad of ten who had been ill for thirteen months with ever-increasing dropsy of the abdomen and scrotum. At autopsy a large tumor occupied the left hypochondrium in the region of the spleen. Many of the regional glands, particularly in the neck, were greatly increased in size. At autopsy these cervical masses consisted of large ovoid, smooth glands connected by loose cellular membranes and minute vessels. Upon cutting there was revealed a firm, light-colored, cartilaginous surface with feeble vascularity. There was no softening. Some glands were found around the vessels in the chest while the bronchial and mediastinal glands were greatly enlarged. There were no frank evidence of tuberculosis and no scars in the lungs, a feature that Hodgkin carefully searched for in all his autopsies. In the peritoneal space there was ascites with recent thin, diaphanous films (lymph clots). There were no nodules in the liver. The spleen was enlarged at least to four times its normal size, mammillated, and the organ was thickly sprinkled with tubercles of a character like those seen in the glands.

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[1] Wilks, S. *Guy's Hosp. Rep.*, Lond., 1865, XI, 56.

[2] *Tr. Roy. Med.-Chir. Soc.*, Lond., 1832, XVII, 17.

The present Guy's Hospital Museum Catalogue gives the description of the present specimen from which our piece was taken:

> 1523. A portion of a spleen with a mass of enlarged glands at its hilum. The surface of the organ is coarsely nodular, and its section shows numerous white areas which histologically are seen to consist of hyaline fibrous material without any appearance of caseation. Ellenborough, K. aet 10 was admitted under Dr. Bright in 1828 with enlargement of the spleen and cervical glands. Anasarca supervened and the patient died about 6 weeks after admission. At autopsy the spleen was found to be "at least 4 times its normal size" and the mediastinal and abdominal lymphatic glands were enlarged and exhibited a "firm cartilaginous structure." See Insp. 6. P. 156 and Prep. 1541 (12) Sec. Edit.

The description of a slide made in my laboratory is as follows: The general picture of Hodgkin's disease histology is readily recognized, the cell structure well preserved and the nuclei well brought out. In fact the histological preservation for both sections is remarkable. In both, the loss of node architecture, the fibrosis as a reticular overgrowth, the scattered presence of the large endothelioid cells and of occasional Reed giant cells can clearly be followed. Eosinophilia is absent from both sections. In both occur small foci of necrosis and scarring, at first suggesting the idea of tubercles. However in none of these are there recognizable Langhan's giant cells, and staining for tubercle bacilli has failed. Moreover while the center of such granules is sometimes definitely a scar, sometimes an uncertain necrosis and sometimes contains endothelioid cells, the lymphoid zone is usually indefinite and often contains polynuclear leucocytes and fragmentary matter mixed with the lymphocytes. The writer would therefore believe these lesions to be necrotic foci of other than tuberculous nature. In both slides one is struck by the apparent reduction in the number of the lymphoid elements.

The second piece of tissue from Ellenborough, K., No. 4768, the cervical glands, has not preserved so well as the spleen and its adjacent glands. The tissue is somewhat broken and the fibers spread apart. Lymphatic tissue is not recognizable. The section consists of a diffusely staining tissue chiefly lightly basophilic, composed of irregular and indefinite strands of connective tissue in a very coarse meshwork. The nuclei of this part of the tissue are very indefinite but seem to have been largely and loosely constructed. In the meshes lie lymphoid cells and single mononuclears with large nucleus and indefinite protoplasm. Here and there one sees multinucleated cells that could correspond to Reed cells. The tissue is acceptable as Hodgkin's disease because it came from the same case as 1523, although it is by no means so convincing as the tissue under that number.

We have, therefore, microscopic sections of pieces of tissue that has been kept in fixative for ninety-seven years. The preservative was spirit for about eighty-two years and formalin for the past fifteen years. The microanatomy is perfectly preserved. It corresponds with what we recognize today as Hodgkin's disease.

CASE IV

Thomas Wescott 50+. Patient was plump but pale and cachectic. There was great enlargement of all glands within reach of examination, especially those of axilla and groin. They had the average size of a pigeon's egg. They were smooth, round or ovoid, moderately firm. There was a mass in the epididymis. Abdomen was distended. Post mortem showed some inadequately described brain lesions. Deep glands larger than more superficial ones. No periglandular inflammation. Glands were smooth, whitish in color, with a few small bloody spots. Section surface was light, pearly white, with a few prominent blood vessels. They were homogeneous, slightly translucent and of the consistency of a testis.

No cystic change. The lesions seemed to be "interstitial deposit from a morbid hypertrophy of the gland structure itself rather than any new or adventitious growth." Lungs and pleura were negative. Heart was dilated on the right side and showed some hypertrophy. Mediastinal glands were enlarged. Superior abdominal and retroperitoneal glands greatly increased in size. Mesenteric glands larger than normal but not so greatly increased as those above; the change in them apparently originated within themselves. There was a lymph stasis. Liver was large, pale and granular. Spleen was nine inches by five inches and proportionately thick; firm, lighter or redder than normal. Section shows almost infinite number of small, white, nearly opaque spots; they were of irregular figure but a few appeared nearly circular; they appeared to depend upon a deposit in the cellular structure of the organ.

Specimen 4769. The tissue cannot be recognized as lymph node. It is an irregular and indefinitely mixed mass of fibrous tissue and cells; the former is both strandwise and mesh-like. There are areas in which cells alone occupy many microscope fields. The tissue has not preserved perfectly but one can make out lymph cells, plasma cells, endothelioid cells, and multinucleated cells that correspond in a general way to Reed cells. There are no tubercular areas. There are no Langhans' giant cells, no eosinophils (all this tissue stains poorly in eosin). It corresponds, therefore, with the present conception of Hodgkin's disease, but is not so convincing as Specimen 1523.

CASE VI

Thomas Black. There were large swellings in the neck, axillae and groins. Abdomen was much distended. The condition dated from two years before when, following a fever, enlargement began on one side of the neck, shortly followed by a swelling on the other side. At autopsy large masses were found in lymph nodes of neck, continuous with a mass in the superior mediastinum. Bronchial glands were unaffected. There was recent pleuritis with serous effusion; this same kind of fluid was in the peritoneum. There were large retroperitoneal masses but the mesenteric nodes were only slightly affected. Liver showed slight cirrhosis with a few white tubercles near the surface. The spleen was of moderate size and free of adventitious deposits. The tumors of this case resemble each other. They were bean to egg size, with a thin capsule and smooth exterior. The capsule was closely applied to, and not separable from, its contents. There was no degeneration. The glands were semi-cartilaginous at first but somewhat softened after a little maceration.

No. 4770. The tissue consists of irregular masses of cells lying in a fine reticular meshwork more grossly divided by basic staining connective tissue strands. It is, however, not in strict alveolar arrangement but more like the growth of cells into a fine fibrillar sponge. The cells are practically all the same throughout the section. They do not stain clearly, the division of structure into nucleus and protoplasm being indistinct. They seem to the writer to belong to the large lymphoid cell sarcoma type and therefore the morbid process resembles that of lymphosarcoma. It is possible that it is a leucemic infiltration into fibrous tissue but if this be, as the notes indicate, from a lymph node, lymphosarcoma seems to be the better classification.

The present conception of Hodgkin's disease is fairly well defined, but it may be well to use the tissue at hand as a text for a few observations on the history of the disease. The chronological development of the history is very well given by Gowers in Reynold's "System of Medicine."[3] It lacks, of course, the studies of Sternberg and the final clarification as given by Dorothy Reed[4] but it is in all essential features complete. Dr. Gowers has also given a perfectly satisfactory description of the clinical and pathological picture. I have been unable, in a reasonably complete review of the literature, to find anything more definitely pointing to the recognition of Hodgkin's disease than is given by Gowers. I would, however, interpret differently some of his literary findings. His first record dates from 1666 by Malpighi, from whose writings he culls the following extract:[5]

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[3] 1879, v, 306.

[4] Reed, D. *Johns Hopkins Hosp. Bull.*, Balt., 1902, p. 133.

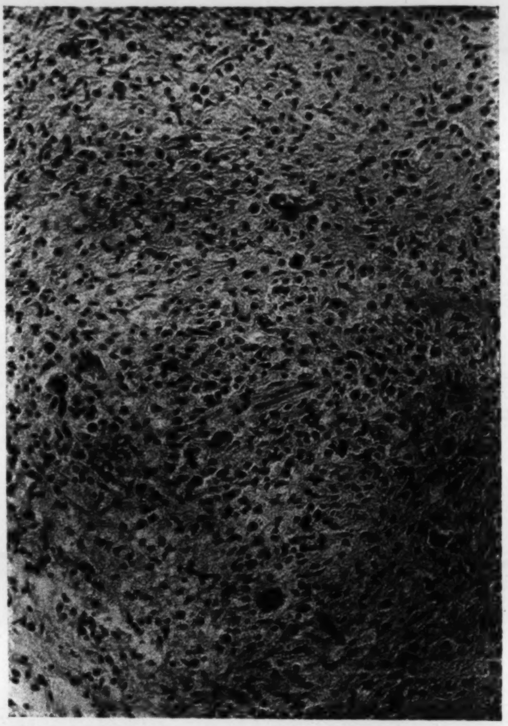
> De quibusdam corporis per Lienem dispersis—
>
> In homine difficilius emergunt: si tamen ex morbo universum glandularum genus turgeat, manifestiores redduntur, aucta ipsarum magnitudine, ut in defuncta puella observavi in qua lien globulis conspicuis racematim dispersis totus scatebat.

This reference was also made known to Hodgkin, when his article was published.

Again in 1752 Morgagni observed a case that differed somewhat from the disseminated tuberculosis of youth. These and other cases puzzled all students because they did not show the usual picture of carcinoma, of encephaloid or scirrhous type, or of scrofula. This was very well pointed out by Craigie,[6] who recognized that there is a disease that lies midway between cancer and tuberculosis, a character further emphasized many years later by Wilks. This publication of Craigie appeared four years before Hodgkin's article and may have given him a thought. Hodgkin admits that others may have observed these cases, but maintains that he is offering the material in greater detail.

As one analyzes his paper it becomes evident that the seven cases he describes are by no means all the same: No. I is obviously tuberculosis; No. III is one of syphilis; No. VI seems much more like acute leucemia or lymphosarcoma than what we understand to be Hodgkin's disease; Case No. V resembles systemic lymphomatosis. This leaves only Cases No. II, IV and VII as acceptable, according to my understanding, and as homogeneous. Wilks and Hale-White admit four of Hodgkin's cases.

After Hodgkin there were several articles confirming the independence of the condition, but it was not until 1865 that Sir Samuel Wilks made it a definite picture by reporting thirteen more cases, of which five are homogeneous and acceptable, three possibly lymphogranuloma and the remaining five very questionable. Wilks certainly gave a better clinical and pathological survey than any of his predecessors. That he should have confused some cases of tuberculosis and low-grade leucemia or lymphomatosis is not surprising, because the diagnosis is frequently difficult today even with acceptable technical methods. It is



Photomicrograph of the Tissue Described under Hodgkin's Case II. The Arrangement and Cellular Structure Are Well Preserved, despite the Age of the Tissue, and Correspond with Present-Day Conceptions of the Lesion.

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[5] Malpighi. De Viscerum Structura. Bonn, 1666. De Liene, Cap. 5.

[6] Craigie, D. Elements of General and Pathological Anatomy. Edinb., 1828, p. 250.

interesting to discover that these older observers consider it to be a disease of the glands *sui generis*, which has nothing to do with tuberculosis. Hodgkin says that the irritation is not introduced via the afferent lymph vessels and that it is not an inflammatory process, because of the absence of the classical signs of inflammation. No one has offered any satisfactory explanation as to the cause of the disease.

The histology became known in 1867, according to Gowers, by the description of Ollivier and Ranvier, but I have been unable to locate their article. The microscopical identity of the disease was settled in 1902 by Dr. Reed's work, which showed, by the use of modern methods, a uniform histological construction of a disease that resembles tuberculosis but is not caused by the tubercle bacillus. The present specimen is the more interesting because it corresponds precisely with the construction marked out by Dr. Reed, and its examination demonstrates that Thomas Hodgkin described at least one case of the disease to which his name is attached. The condition might with equal justice be called Wilks' disease, a remark made by Sir William Hale-White in a recent admirable analysis of the medical life of Thomas Hodgkin. Indeed the description given by Craigie might with some propriety justify the application of this pathologist's name to the morbid entity. Sir William Hale-White explains the reputation of Hodgkin and his disease in the following words: "He owes his celebrity to the chivalrous honesty of Wilks." Dr. Wilks reported in 1856 a series of cases of lardaceous disease, some of which corresponded to those described by Hodgkin. He was at the time unaware of Thomas Hodgkin's original paper of twenty-four years before because this paper was so "uninspiring," to use Hale-White's term, that its importance had been insufficiently recognized and its existence forgotten, possibly because of its indefiniteness and because the author had not followed up the subject to clarify and expand his discovery. Despite this neglect he was fortunate, as Hale-White points out, because in 1865, when Wilks recast his studies of lardaceous disease of lymphatic tissue, he made amends by giving the name of Hodgkin disease to the condition. I venture the observation that once again Hodgkin has been fortunate, since it now seems certain that he observed and recorded a new disease, specimens of which, examined by modern methods, have retained their identity a hundred years and justified the separation he made.

However, the medical life of Thomas Hodgkin must not be judged lightly, as is well illustrated in Hale-White's kindly review. This gentleman points out that in many ways Hodgkin affected the activities of English medicine. He seems to have been responsible for the introduction of the stethoscope into England, having studied with Laënnec in Paris. He organized the Museum at Guy's Hospital and prepared the first catalogue, certainly an achievement, and one that helped to place the medical school of that institution in the front rank of teaching centers of London. Hodgkin helped to develop the microscope and to make known the pharyngeal mirror. But Hodgkin's activities in other lines, in medical reform and in philanthropy, prompt Hale-White to observe that, but for these interests, he might have achieved greater success in medicine.

I wish to acknowledge with appreciative thanks the kindness of Dr. Stokes and Mr. Davies-Colley in permitting me to study the data, for giving me the tissue and for the many courtesies received when their guest.

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ABRAHAM CHOVET*

By WILLIAM SNOW MILLER, M.D.

MADISON, WISCONSIN

SOME years ago, while looking up the history of the use of corrosion preparations and models in the teaching of anatomy in the United States, I came across the following, written by John Morgan, of Philadelphia, in 1786:

> Such is the present state of anatomy in this country that there are at present but few, I believe I may say no such preparations worth mentioning to be met with here, that have been made in America. Dr. Chovet, now a resident in this City, has indeed a good collection of wax preparations, of different parts of the human body, which he made in his younger days and brought hither from Europe. But nothing of this kind has hitherto been practiced or has been so taught as to have been of lasting use to any that I know of.

Two questions at once presented themselves: Who was Dr. Chovet? What were the preparations, and what became of them?

For a number of years I have devoted considerable time to an attempt to answer these questions and I am compelled to state that the answer to the first is, in a great measure, unsatisfactory, and that the answer to the second is also, though in a different sense, unsatisfactory.

Of the early life and education of Chovet, little is known. His father was David Chovet, a wine merchant of London. The only record of his birth, which I can find, is that deeply scratched on the back of the frame of a miniature which was presented to the Pennsylvania Hospital: "Dr. Habraham Chovet, born May 25, 1704; drawn May 25, 1784, by his servant, Dr. Eckhout."

There seems to be some uncertainty as to his nationality. In a footnote, Ruschenberger says the name "is not French but an English patronymic; one of a class of two syllable names ending in *et* or *ett*, as Cobbett, Collet, Levet." George W. Norris in "The Early History of Medicine in Philadelphia" says: "He was a native of England, and devoted much of the early part of his life to the study of anatomy under the ablest teachers in Europe." Chastellux gives England as his native country and goes on to say that, "after studying medicine and surgery there, he went to France to improve himself under M. Winslow."

On the sixth of August, 1720, when but a little over sixteen years of age, Chovet was apprenticed for seven years to Peter Gougoux Lamarque, a surgeon and foreign brother of The Worshipful Company of Barber-Surgeons of London, in consideration of £105. This seems to give some support to those who claim he was of Huguenot extraction. After the conclusion of his apprenticeship he evidently spent some time abroad, for both Chastellux and Norris say he studied anatomy outside of England. Chastellux especially mentions Winslow, of Paris, as one of his teachers; this, and his record after returning to London, confirms the statement by Norris that he specialized in anatomy.

On his return to London he must have given private lectures on anatomy, for we find that in the year 1732, he issued "A Syllabus, or Index of all the Parts that enter the Composition of the Human Body." This was a small brochure of twenty-six pages, the title-page of which is reproduced here.

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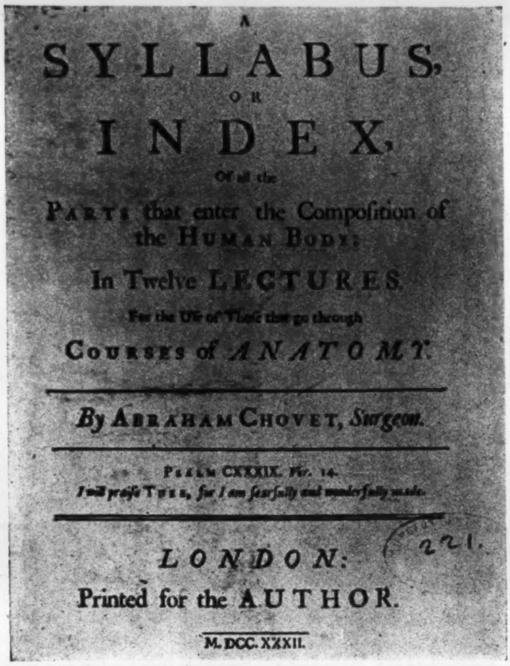
* Read at the November, 1924, meetings of the Medical History Seminar, University of Wisconsin.

NOTE. In 1911, I published in the *Anatomical Record* a sketch of Abraham Chovet. Since that time I have acquired additional information concerning this early teacher of anatomy which is incorporated in the following paper. Dr. M. J. Greenman has kindly consented to my using the original publication in connection with this extended account.

In the early part of the eighteenth century a series of wax anatomical figures made by Desnouë, who is described as professor of anatomy to the Academy of Sciences at Paris, was brought to London. At first they were used for exhibition purposes only (admission 5s per head); later they were used by various private lecturers on anatomy for demonstration purposes. Among those who made use of them was Chovet. These wax figures apparently did not satisfy Chovet, and he endeavored to improve them. This is shown by the concluding paragraphs of the preface to his Syllabus:



A
SYLLABUS,
OR
INDEX,
Of all the
PARTS that enter the Compoſition of the HUMAN BODY:
In Twelve LECTURES
For the Uſe of Thoſe that go through
COURSES of *ANATOMY*.

By ABRAHAM CHOVET, *Surgeon.*

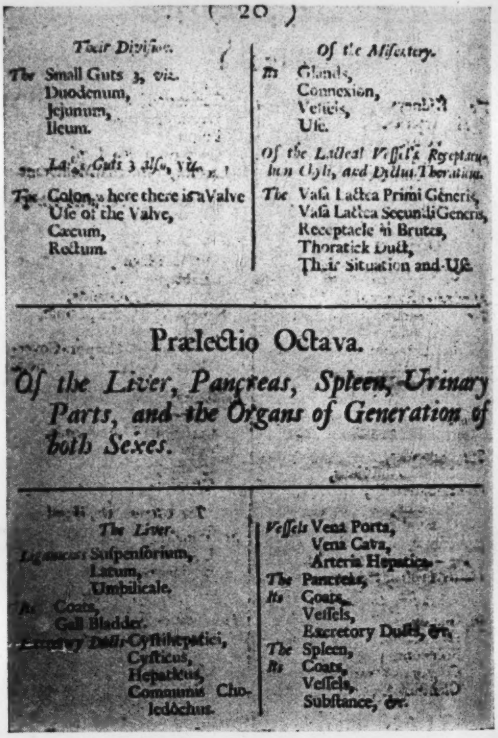
PSALM CXXXIX. *Ver.* 14.
I will praiſe THEE, *for I am fearfully and wonderfully made.*

LONDON:
Printed for the AUTHOR.
M.DCC.XXXII.

221.

TITLE PAGE OF CHOVET'S SYLLABUS. SIZE OF THE ORIGINAL PAGES OF THE SYLLABUS ABOUT 220 × 150 MM.

> I have likewise contriv'd a body in wax (now in hand) wherein the action of the heart and lungs, and the circulation of the blood, will be made visible, which I hope in some time to compleat.
>
> I am also provided with natural and artificial preparations sufficient for giving a compleat course of anatomy, which will be of great use to young beginners for the first course, in order to prepare them for the knife; as also those who are willing to be informed in the natural structure, tho' not devoted to the practice of physick or surgery, and are often times offended at the smell and sight of a dissected body, for which reason I have compiled this Syllabus as brief and suitable thereto, and as much in English as the nature of the subject will permit, avoiding many superfluities.



(20)

Their Diviſion.
The Small Guts 3, *viz.*
Duodenum,
Jejunum,
Ileum.

Large Guts 3 *alſo, viz.*
The Colon, where there is a Valve
Uſe of the Valve,
Cæcum,
Rectum.

Of the Meſentery.
Its Glands,
Connexion,
Veſſels,
Uſe.

Of the Lacteal Veſſels, Receptaculum Chyli, and Ductus Thoracicus.
The Vaſa Lactea Primi Generis,
Vaſa Lactea Secundi Generis,
Receptacle in Brutes,
Thoratick Duct,
Their Situation and Uſe.

Prælectio Octava.

Of the Liver, Pancreas, Spleen, Urinary Parts, and the Organs of Generation of both Sexes.

[illegible]
The Liver.
Ligaments Suſpenſorium,
Latum,
Umbilicale.
Its Coats,
Gall Bladder.
Excretory Ducts Cyſtihepatici,
Cyſticus,
Hepaticus,
Communis Choledochus.

Veſſels Vena Porta,
Vena Cava,
Arteria Hepatica.
The Pancreas,
Its Coats,
Veſſels,
Excretory Ducts, *&c.*
The Spleen,
Its Coats,
Veſſels,
Subſtance, *&c.*

PAGE 20 OF CHOVET'S SYLLABUS.

Here we see Chovet putting into practice a principle that many of the modern teachers of anatomy advocate, namely, that of studying models and moist preparations before beginning the actual dissection. In this way the student obtains an idea of what he is to look for when working on the cadaver.

The similarity in the wording of the announcement of his lectures in Philadelphia to the closing paragraph of the preface of his Syllabus is striking and shows that at that time he still had in mind the same educational principle.

The Syllabus is divided into three parts:

the first, Osteologia, is covered by three lectures; the second, Myologia, also extends over three lectures; the third, Enterologia, occupies the remaining six lectures.

The page of the Syllabus reproduced shows the attention that the lymphatic system received in those days. It is to be regretted that in these days of advanced anatomy it receives so little attention in many of the dissecting rooms. When he considers the heart and lungs, he also considers the circulation of the blood.

His knowledge of the anatomy of the brain was quite comprehensive, as the following extract from his Syllabus shows:

Dura Mater

Its First Process, the Falx
    Second Process
    Third Process

Sinuses

The Longitudinalis Superior
    Inferior
    Rectus
    Latteralis, &c
    Torcular Herophili
    Pia Mater

Cerebrum

    Hemispheres, 2
    Lobs, 4
The Carotide Arteries
    Cervicals
    Glandula Pittuitaria
The Substances 2 viz.
    Corticalis Cineria
    Meddullaris Alba
    Centrum Ovale
    Corpus Callosum
    Fornix
    Septum Lucidum

Medulla Oblongata

The Crura
    Ventriculi Anteriores, with the 3d and 4th
    Corpora Striata
    Thalimi Nervorum Opticorum
    Nates
    Testes
    Glandula Pinealis
    Plexus Choroides
    Corpora Olivaria
    Protuberantia Annularis

In his enumeration of the cranial nerves he shows that he, like most of his contemporaries, failed to recognize the true sixth pair of nerves. He lists ten pairs of nerves, as follows:

1st Par Olfactorium
2d Opticum
3d Oculorum
4th Patheticum
5th Gustatorium
6th Produce the Intercostals
7th Auditorium
8th Vagum
9th Accessorius
10th Recurrens

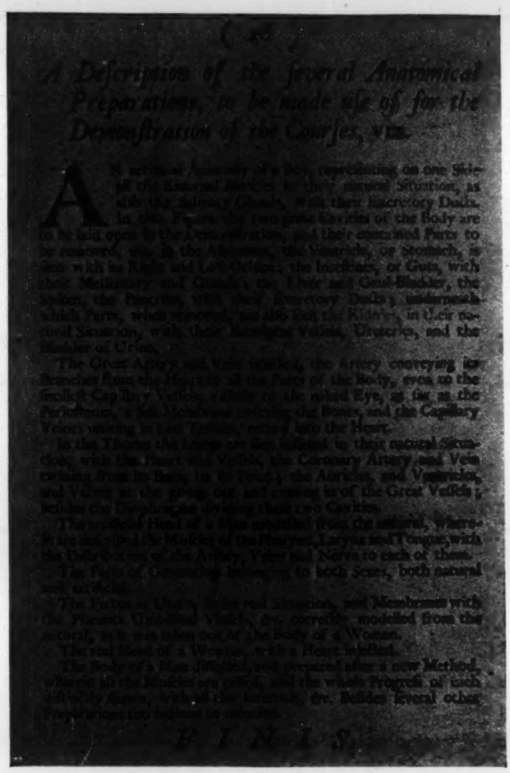
If, as Chastellux states, Chovet was a student under Winslow, it is somewhat surprising that he failed to recognize the true character of the intercostals, ascribing them to the sixth pair of cranial nerves and not to the sympathetic nerve. In his description of the sympathetic nerve Drummond says:

> This nerve has been variously named by authors. The older anatomists described it under the name of the great intercostal nerve. From the fact of its being chiefly distributed to the viscera belonging to the circulatory, digestive and generative systems, it was termed by Chaussier the trisplanchnic nerve; and under the supposition that it alone influences the organic processes, it was termed by Bichat the nervous system of organic life. The name sympathetic, or great sympathetic, was given it by Winslow, from its being believed to be the channel through which are effected the different sympathies sometimes found to exist between distant organs when in a morbid condition.

The English anatomists did not agree with Winslow, for Monro and Cheselden ascribed the intercostals to the sixth pair of nerves. It was not until the time of Bell that they began to recognize their mistake.

The last page of the Syllabus contains so much of interest that I have reproduced it in full. It gives us an insight into the method of teaching anatomy in the middle of the eighteenth century. Models and carefully prepared preparations supplement demonstrations on the cadaver. Surely Chovet had advanced ideas of anatomical study.

Chovet's discontent with the anatomical figures of Desnouë led him, as already stated, to prepare an entirely new set. At first these were, like those of Desnouë, used for exhibition purposes, for the following announcement was published in the December 27, 1733, issue of the *London Evening Post:*



A Deſcription of the ſeveral Anatomical Preparations, to be made uſe of for the Demonſtration of the Courſes, viz.

F I N I S.

Last Page of Chovet's Syllabus.

> To be seen this day and for the future, price 5s, at Mr. Lamark's,[1] Surgeon, in Orange Street, Leicester fields, Mr. Chovet's, the surgeon's, New figure of Anatomy, which represents a woman chained down upon a table, suppos'd opened alive; wherein the circulation of the blood is made visible through glass veins and arteries: the circulation is also seen from the mother to the child, and from the child to the mother, with the Histolick and Diastolick motion of the heart and the action of the lungs. All which particulars, with several others, will be shown and clearly explained by Mr. Chovet himself. Note, a Gentlewoman qualified will attend the ladies.

In August, 1734, Chovet was appointed one of the demonstrators of anatomy to the Barber-Surgeons of London, and June 28, 1735, he announced the time of the first lecture:

> Notice is given that Mr. Chovet's Anatomical and Chirurgical lectures on the bones, etc., will begin on Monday next at Barbers' and Surgeons' Hall, and will continue for a week successively, precisely at 6 in the evening, in the Amphitheatre.

Chovet's appointment as demonstrator of anatomy did not interfere with his giving a private course in anatomy; for in the September 6, 1735, issue of the *London Evening Post*, the following announcement appeared:

> On 29th Sept. will begin a Compleat private course of human Anatomy with all the principal observations in surgery, fractures, dislocations, and their several bandages, in which Course all the causes of the various diseases will be clearly explained with suitable observations on the Natural Oeconomy by Abraham Chovet, surgeon and Demonstrator of Anatomy at Surgeons' Hall, at his house Leicester Square, where particulars may be had, as also at Mr. Lee's, surgeon on Saffron Hill, near Holbourn Bridge.

This course of lectures was apparently successful, for an announcement of its repetition on December 23 was made. Particulars for this course could be obtained at the same places as for the previous course, and in addition at the Rev. Dr. Desaguliers' in Channel Row, Westminster.

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[1] This is probably the Peter Gougoux Lamarque to whom Chovet was bound as apprentice. In the records of the Barber-Surgeons his name is written "Peter Gongoure le marque." The variations in spelling often make it exceedingly difficult to trace English biography.

For many of the facts connected with Chovet and the Barber-Surgeons I am indebted to the late Sidney Young, F.S.A., Past Master of The Worshipful Company of Barbers of London, and author of "The Annals of the Barber-Surgeons of London." Finding the notes in the Annals insufficient, he most kindly made transcripts of such minutes as he thought of interest and placed them at my disposal:

Extracts from the Records of The Worshipful Company of Barber-Surgeons of London

At a Court of Examiners holden 5th Fbry. 1734.

(present Mr. James Ferne, Master, Mr. Barnwell, Mr. Bridges, Mr. Watts, Wardens, Mr. Myddleton, Mr. Petty, Mr. Wheeler).

Abraham Chovett (Surgeon) who had been bound to Peter Gongoure le marque a Foreign Brother of the Company, was Examined touching his skill in Surgery in order to be admitted a Foreign Brother. His answers were approved and he was ordered a diploma under the seal of the Company, admitting him as such for Three pounds three shillings, which he paid down and was sworn a Foreign Brother of the Company.

At a Court of Assistants holden 6th Aug. 1734.

Mr. Abraham Chovett Surgeon and a Foreign Brother took up his freedom of the Company for Three pounds three shillings which he paid down and was sworne, and then The said Mr. Chovet took the Livery and Clothing of the Company and gave his note for the usual fine of Ten pounds.

In the "Annals of the Barber-Surgeons" the following entry appears: "15th August, 1734. Mr. Abraham Chovett and Mr. Peter Maccullock were chosen Demonstrators of Anatomy."

It is quite probable that the full entry for August 15, 1734, was the same as that of the following year:

At a Court of Assistants holden 21st August 1735.

Then the Court . . . did appoint Mr. Abraham Chovett and Mr. Peter Maccullock Demonstrators of Anatomy for the year ensuing. And it is ordered that each of them shall have the Dissecting of one Publick and one Private body and shall not interfere with each other otherwise than to assist each other for the Publick Service.

It is ordered that the Demonstrators for the time being shall be invited to all Publick Feasts of the Company when the Masters and Stewards of Anatomy are invited.

It is to be noted in the entries of February 5, 1734, and of August 6, 1734, that Chovet is described as a "Foreign Brother." This did not necessarily mean he was a foreigner or alien in the modern acceptation of that word, but a surgeon who practiced within the jurisdiction of the Company of Barber-Surgeons of London and was not "free" of the Company by patrimony, servitude or redemption. Peter Gongoure le marque was, as his name implies, a foreigner practicing in London and so compelled to become a Foreign Brother of the Company or be debarred from practicing.

In a private letter Sidney Young wrote me as follows:

You will notice that on 6th Aug. 1734, Chovett came into our Guild and took up his "freedom" by redemption and then the higher grade of the "Livery."

I should think that he did this with the knowledge that on the 15th of the same month he was to be chosen Demonstrator of Anatomy and it was considered desirable that such an important office should be held by a Liveryman and not by a mere "F.B."

The "Publick body" referred to in the minute of 21, Aug. 1735, would be that of a criminal executed for felony which our Company gave out of the stock of those unfortunates of whom we had a plenty, and Chovett would be allowed that body to experiment upon before his own class of students (and not before the Surgeons and their apprentices within the Company).

The "Private body" would be one obtained from the Resurrectionists and used for the same purpose. These were special privileges granted to the Demonstrators of Anatomy by the Court.

It is quite probable that on account of his success as a lecturer on anatomy and the issuing of his Syllabus he was invited to join the barber-surgeons and become one of their demonstrators.

In one of his letters to me Sidney Young said: "I should think from his position and his residing in Leicester Square, that he must have been an eminent surgeon of the time." In another letter he again referred to Chovet "as living in Leicester Square which at that time was the fashionable locality for surgeons in large practice."

In 1736, Chovet resigned his position as demonstrator:

> At a Court of Assistants holden 19th Aug. 1736.
>
> Our Master acquainting the Court that he had received a letter from Mr. Chovett wherein he expressed a just sense of the favor the Court had done him to choose him Demonstrator the two former years and returned his thanks for the same. But in regard to his other desire the Court would please to supply his place by the choice of some other.

Chovet's request was granted, and we find recorded in the Annals of the Barber-Surgeons under the same date: "Mr. Peter Maccullock and Mr. Caesar Hawkins were elected Demonstrators."

In a footnote to the abstracts sent me by Sidney Young he said: "Mr. Chovett's name appears in the list of Liverymen for the year 1740, but not afterwards. This is presumptive evidence that he was dead before the list for the year 1741 was made up." How far this was from the truth the remainder of this sketch will show.

There seems to be considerable mystery surrounding the occasion of Chovet's resignation as demonstrator in The Barber-Surgeons Company and his removal from London. S. Weir Mitchell, in his "Commemorative Address at the Centennial Anniversary of the Institution of the College of Physicians of Philadelphia," makes the following statement:

> Of the cynical and merry tory Abraham Chovet, there is little to say. Dr. Physick told my father that while living in London, Chovet tried to save a too adventurous gentleman about to be hanged for highway robbery, by opening his trachea before the hangman operated. The patient was rapidly removed after the execution, and is said to have spoken. A queer tale, and doubtful, but worth the telling. The government is said to have lacked due appreciation of this valuable experiment, and Chovet brought his queer Voltairian visage to America.

I have been unable to obtain any confirmation of the first statement and the last statement is not quite correct. According to Chastellux,[2] and Norris, Chovet spent some years in the Barbadoes and afterwards went to Jamaica.

In "The Autobiography of a Quack," S. Weir Mitchell introduces Chovet as one of his characters, and brings in the above story. An interesting point in the story as given in the Autobiography is that he gives a date for the time when Chovet performed his experiment. He says: "This was about 1760." According to Sidney Young, Chovet was supposed to be dead in 1741; and, as it will be shown further on that there is positive evidence that he was in Jamaica at that time, it is impossible to harmonize the story with the facts.

In 1909, when I began the collection of facts concerning Chovet, I visited the College of Physicians in Philadelphia. During the course of a conversation with Mr. Fisher, the librarian, I heard the door open behind me, and a moment later a tall man with stooping shoulders stood by my side and said: "Abraham Chovet! Abraham Chovet! What do you know about him?" Looking up I at once recognized the speaker as S. Weir Mitchell. In reply to his question I said: "I know but little; but am trying to find out more. What do you know?" He replied: "He was a bad man! a *very* bad man." "Yes," I replied, "I know you have said so. But what did he *do* that was bad?" Mitchell replied: "My father said he was a bad man, a *very* bad man." "I know your father said he was a bad man," I replied, "but *what* did he do that was bad?" Mitchell answered as before, "My father said he was a bad man, a *very* bad man!!" In reply I said: "You are going around in a circle and we are not getting anywhere." With this the conversation changed, and he asked me if I would care to see the library and building. I was only too pleased to have him for a guide, and I spent two delightful hours with him. The question of the "badness" of Abraham Chovet did not again come up; but during our discussion of Chovet's portrait he told me that at one time there was a rumor that Chovet's diary was extant, and that he had offered a reward of $50 to the person who would produce it, without success.

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[2] *The Universal Asylum and Columbian Magazine*, 1790.

Whatever the cause of Chovet's leaving his surgical practice in the fashionable quarter of London, he did not lose his interest in anatomy. The conditions in Barbadoes were not conducive to work; yet he worked. Chastellux says he was "invariably a man of application, and laborious. In the war of 1744, a prize being brought into Barbadoes, with a great deal of wax on board, Mr. Showell [a misspelling] took this opportunity to make different anatomical experiments in wax, and succeeded so well as to carry this art to the highest perfection."

Peachey says that in 1747, during his residence at Antigua, Chovet's name appeared as a subscriber to the Protestant schools in Ireland; and that this, taken in connection with his association with Dr. Desaguliers, suggests that, like Peter Gougoux Lamarque and Desaguliers, Chovet was of Huguenot extraction.

Antigua was not to be Chovet's permanent residence, for he was next heard of in Kingston, Jamaica. For the single item I have in regard to Chovet's life in Jamaica I am indebted to Sir D'Arcy Power, F.R.C.S. In *The Gentleman's Magazine* for the month of May, 1759, under the promotions for the year 1759, appears the following: "Abra. Chovet, Esq; surgeon, of Kingston in Jamaica, a Dr. of physick."

D'Arcy Power writes: "I cannot find that this M.D. was conferred by Oxford: there is no list of Cambridge graduates and there is no list of M.D.'s given by the Archbishop of Canterbury."

If the story narrated by S. Weir Mitchell be true, it seems strange that this degree should have been conferred on Chovet.

Jamaica was not, however, to be the final abode of Chovet. In order to escape an impending insurrection of the slaves he fled with his wife and widowed daughter to Philadelphia. The date of his arrival in Philadelphia is uncertain. In the notice of his death, which appeared in the *Universal Asylum and Columbian Magazine* for March, 1790, it is given as 1770. Norris, in "The Early History of Medicine in Philadelphia," gives 1774 as the date.

Almost immediately after the arrival of Chovet in Philadelphia he began giving lectures on anatomy. On October 12, 1774, the following announcement appears[3]:

> *At the* ANATOMICAL MUSEUM *in Videl's Alley, in Second street, Philadelphia,*
>
> Doctor Chovet intends some time in November, to begin a Course of Lectures upon the visceral anatomy and vital oeconomy of the Human Body, founded on the visible and most intimate structure of the parts, in which will be shown all the blood vessels, together with the Lymphatics, glands, &c. also the course of the nerves, as they arise from the brain and spinal marrow even to their respective terminations; but particularly those belonging to the five senses: So that as these lectures will be delivered on his elegant Anatomical Wax-work Figures, and real preparations of the parts beautifully embalmed and prepared, the curious as well as the students in Physick, may obtain a compleat knowledge of their own structure, towards laying a foundation for a rational practice of physick; as this course of lectures will include a compleat graphycal and natural history of the Animal oeconomy, without even the aspect of a recent dead body, which often disgusts those, who otherwise would have both curiosity and inclination to attend that useful study; It is presumed his method of introducing Anatomy will prove agreeable and satisfactory.

The same announcement appears in the issue for November 15, except the words

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[3] *Pennsylvania Journal and the Weekly Advertiser.*

"the 25th Nov. instant" are substituted for "some time in November."

In the issue of the same journal for November 9, 1774, and in the issue of the *Pennsylvania Gazette* for the same date, the following announcement of his introductory lecture appears:

> On Friday, the 25th of November, at Six o'Clock in the Evening, Dr. CHOVET will deliver the Introductory Discourse to his PHYSIOLOGICAL and ANATOMICAL LECTURES, at his Museum, in Vidal's-alley, Second-street.

The occasion of the introductory lecture was made a notable event, as the following account shows[4]:

> On Friday last Dr. ABRAHAM CHOVET delivered an introductory discourse to his Anatomical and Physiological Lectures, at his new Theatre in Vidal's alley, in the presence of his Honour the Governor, the Trustees and Faculty of the College, the Clergy, the Doctors of Physic, the Students of Medicine, and a considerable number of the most respectable inhabitants of this city.—The Doctor introduced the evening's entertainment, with an elegant Latin oration on the origin and dignity of Physic, which was succeeded by a very learned and ingenious discourse in English, on the history, excellence and extent of the sciences of Anatomy and Physiology, wherein he made very honourable mention of those venerable names, who in every age had contributed to their advancement. His curious wax-work figures, together with his numerous and very skilful injections and preparations of various parts of the human body, attracted the attention of every spectator; and were no less an evidence of a fine taste, judgment and accuracy, than the Lecture was of extensive reading, and perfect knowledge of the subject on which he treated. During the exhibition the company gave the strictest attention, and satisfaction evidently impressed upon every countenance, testified a grateful sense of the pleasure they enjoyed. The whole was conducted with the greatest politeness and decorum, and the company departed, expressing themselves in the highest terms of approbation.

The notice of the regular course of lectures appears in the same journals[5] for November 30, and December 7, 1774:

> At the ANATOMICAL MUSEUM in Videl's Alley, Second street, on Wednesday the 7th of December, at six in the evening, Doctor CHOVET will begin his Course of ANATOMICAL and PHYSIOLOGICAL LECTURES, in which the several parts of the human body will be demonstrated with their mechanism and actions, together with the doctrine of life, health and the several effects, resulting from the actions of the parts, on his curious collection of Anatomical wax-work, and other natural preparations, to be continued the whole winter until the course is compleated.
>
> As this course will not be attended with the disagreeable sight nor stench of recent diseased or putrid carcasses, which often disgust, (even the students in physick) as well as the curious, otherwise inclined to this useful and most sublime part of natural philosophy, it is to be hoped this undertaking will meet with suitable encouragement.
>
> TICKETS to be had for the whole course at Doctor Chovet's house in Second-street, Philadelphia.

Norris, writing about the year 1845, says:

> The building still stands upon the south side of the alley. It is a quaint-looking old-fashioned two-storied brick house, with a steep pitched roof and dormer windows; it is now used as a carpenter shop. In this locality his lectures continued to be given, and his anatomical collection remained until 1777, when the latter was removed to his dwelling in Water Street, near the old ferry. Here he erected an amphitheatre in which his lectures were afterwards delivered, the first being given there in January, 1778.

One of those who attended Dr. Chovet's first course of lectures has recorded the fact. Christopher Marshall, a retired druggist, makes this concise entry in his diary under the date of January 27, 1775, "At Dr. Chovet's lecture." In the process of time these two men became friends. We shall meet them again before this account is finished.

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[4] *Pennsylvania Gazette*, Nov. 30, 1774.

[5] *Pennsylvania Journal and the Weekly Advertiser* and *Pennsylvania Gazette*.

During the years 1776 and 1777 (?) the lectures given by Chovet appear to have been the only lectures on anatomy that were given in Philadelphia. Dr. William Shippen, Jr., the professor of anatomy at the University, was at this time with the army and unable to give his course of lectures.

Chovet must have been, at this time, a man of some property. In London he lived in Leicester Square, noted in after years as the residence of John Hunter, and in Philadelphia he was able to live in what was, at that time, the chief place of residence of the best families of the business class, Water Street, and to build there in connection with his dwelling an anatomical amphitheater. Soon after the peace of 1783, we find him located in Race Street, between Third and Fourth Streets; Water Street had in a great measure lost its prestige. Front Street and Second Street with the streets leading off from them had become the medical center. Dr. Rush lived on the east side of Front Street, above Walnut Street, in a "bank house without a foot of yard." Locality did not play as important a part in a physician's success then as now. Norris describes Chovet as being "a very popular physician, who came here from the West Indies," and his location on the outskirts of the chief medical center, in 1783, does not seem to have interfered with his practice. At this time he apparently had given up his anatomical lectures, for I have been unable to find any reference to them after his removal to Race Street.

Previous to Chovet's appointment as demonstrator of anatomy in The Barber-Surgeons Company he had prepared a considerable number of wax models, the list of which is given on the last page of his Syllabus, and from his preface we learn that he had still others in contemplation.

John Morgan said: "Chovet . . . has indeed a good collection of wax preparations, of different parts of the human body, which he made in his younger days and brought hither from Europe."

I have previously quoted Chastellux's statement that the preparations brought to Philadelphia by Chovet were made in Barbadoes. Norris, in his sketch of Chovet in "The Early History of Medicine in Philadelphia," says: "Dr. Chovet brought with him a complete and beautiful collection of anatomical preparations which he made in Barbadoes in 1744."

It would seem, therefore, that the statement of Morgan was not correct and that Chovet did not bring to Philadelphia those preparations made previous to 1732, but an entirely new collection made in Barbadoes. No wonder Chastellux describes Chovet as "invariably a man of application, and laborious."

John Adams was appointed one of the delegates from Massachusetts to meet with delegates from the other States in Congress, at Philadelphia, on the first day of September, 1774. He arrived in Philadelphia August 29, 1774, and on the following day, Tuesday, August 30, "towards the evening, Mr. Thomas Smith . . . and Dr. Shippen and his brother, and Mr. Reed, went with us to the Hospital."

After visiting various parts of the hospital, Mr. Adams goes on to say:

> Dr. Shippen then carried us into his chamber, where he showed us a series of anatomical paintings, of exquisite art. Here was a great variety of views of the human body, whole and in parts. The Doctor entertained us with a clear, concise and comprehensive lecture upon all parts of the human frame. This entertainment charmed me. He first showed us a set of paintings of bodies, entire and alive, then of others with the skin taken off, then with the first coat of muscles taken off, then with the second, then with all—the bare bones. Then he showed us paintings of the insides of a man, seen before, all the muscles of the belly being taken off; the heart, lungs, stomach, &c.

I have quoted the above quite fully, for on Friday, October 14, Mr. Adams went to see Chovet and his collection and has made a most interesting comparison:

> Went in the morning to see Dr. Chovet and his skeletons and wax-works—most admirable, exquisite representations of the whole animal economy. Four complete skeletons; a leg with all the nerves, veins, and arteries injected with wax; two complete bodies in wax, full grown; waxen representations of all the muscles, tendons, &c. of the head, brain, heart, lungs, liver, stomach, &c. *This exhibition is more exquisite than* that of Dr. Shippen at the hospital.[6] The Doctor reads lectures for two half joes a course, which takes up four months. These wax-works are all of the Doctor's own hands.

John Adams gives only a partial list of what Chovet had in the way of anatomical equipment for instructional purposes. Not all of his equipment was in the form of wax models; he had a good supply of skeletons, better than some of the modern-day medical schools (Flexner), besides a number of well-made dissections and injections. It is fortunate for us that John Adams recorded so faithfully what he saw. It is quite evident that Chovet's collection was superior to the collection at the hospital. We have heard a great deal about Dr. Shippen and the hospital collection, and nothing at all about Dr. Chovet and his superior collection. It is difficult to understand the neglect.

Chovet had no place in the hospital, or in the young medical school, which in after years grew into the medical department of the University of Pennsylvania, though I cannot but believe he was much the best anatomist in Philadelphia.

In order to understand what became of the collection which Chovet had, with so much industry, gathered together, we must go back to the year 1762, some years previous to the arrival of Chovet in Philadelphia.

At a meeting of the managers of the hospital held in the warden's room at the court house, November 8, 1762, Dr. William Shippen, Jr., informed them that a gift from Dr. John Fothergill, of London, consisting of eighteen different views of anatomical structure in crayon, three cases of anatomical models and one case containing a skeleton and fetus, had reached Philadelphia. The three cases contained three castings in gypsum. It is this collection that Dr. Shippen showed to John Adams.

George B. Wood in "An Address on the Occasion of the Centennial Celebration of the Founding of the Pennsylvania Hospital" says:

> These served as the basis of a Museum, which was afterwards greatly increased (April, 1793) by the purchase from the executors of Dr. Chovet, an eminent, but somewhat eccentric physician of Philadelphia, of his collection of preparations and wax models, then deemed master-pieces of art in that department. The museum thus created was considered at one time among the greatest attractions of the Hospital, and even added somewhat to its receipts. But losing at last its value in this respect, and occupying space which was wanted for the more important purposes of the Institution, the Managers very courteously made an offer of it to the University of Pennsylvania, where it might be employed to greater advantage. The purchased cabinet of Dr. Chovet was made an absolute gift; but the collection presented by Dr. Fothergill, as the Managers did not conceive that they had the authority to alienate it, was merely placed with the University on deposit. The transfer was made in April, 1824, and the two collections at this time (1851) form a part of the Wistar Museum.

The way by which the managers acquired the necessary funds to purchase Chovet's cabinet is given by William Barton in his "Life of David Rittenhouse." He says:

> The Students in the Medical School of the University pay ten dollars per annum, for the privilege of attending the Hospital-practice which is of very important advantage to them: and the physicians, with the managers, have generously appropriated a fund out of the monies, thus obtained, for the purpose of founding a Medical Library, and of purchasing the late Dr. Abraham Chovet's most curious anatomical preparations.

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[6] Italics mine. W. S. M.

In the June 29, 1793, issue of the *Independent Gazetteer* the following notice appeared:

> We hear that the Managers of the Pennsylvania Hospital have lately purchased the Cabinet of the curious anatomical preparations of the late Dr. Abraham Chovet. These preparations, with the castings presented to the Hospital by the late Dr. Fothergill, cannot fail of rendering that institution a most useful school for medical instruction, especially as those preparations and castings are, it is said, to be made subservient to the lectures upon Anatomy, which are given in the University of Pennsylvania.

Probably Dr. Shippen was only too glad to have the use of the fine preparations made by Chovet; and the hospital, though Chovet did not have a place on its staff, considered itself fortunate in acquiring his collection.

Following the death of Chovet in 1790, and previous to its purchase by the managers of the Pennsylvania Hospital, the executors of Chovet's estate apparently placed his collection on exhibition; for the *Pennsylvania Packet* for June 24, 26 and 29, 1790, contains the following advertisement:

> The Anatomical Museum of the late Dr. Chovet, is now opened for the inspection of the Curious, at No. 22, in Spruce street, a few doors below Second street.
>
> It contains several Wax Figures of different Sizes, so formed as to give an exact and compleat View of the internal Structures of the Human Body at different periods of life; and also a Variety of real Preparations, calculated to demonstrate the Structure and Situation of the various Organs of the body, with the Effects produced in them by several Diseases.
>
> Time of Admittance, in the Morning from 10 to 12 o' Clock, and in the Afternoon from 3 to 5. Price—One Dollar.

In Morton's "History of the Pennsylvania Hospital," a more complete account of the collection is given:

> In 1793, the Managers acquired for the Museum a very remarkable collection of anatomical preparations, including dried, injected and painted specimens, together with a series of beautiful wax models by Dr. Abraham Chovet, by purchase from his heirs. The collection, especially the wax preparations, were regarded at that time as masterpieces of art.

The following unique arrangement for the care of the Museum made by the managers of the hospital, August 26, 1799, is given by Morton: "Wm. Stevens Jacobs to board in the house during the prevalence of Yellow fever and while here to put the museum in good order, to pay $4 per week for his board, find his own liquor, and not to go to the city during the fever."

In 1805 a catalogue of the Museum and Library was compiled and printed, and in 1806, Samuel C. Hopkins was appointed caretaker of the Museum. On assuming his duties he gave the following receipt for the collection placed under his care:

> Penns. Hospital, 25th 8 mo. 1806.
>
> Received under my care and responsibility from the Managers of the Hospital all the articles of the Anatomical museum contained in the list thereof viz:
>
> Imitations of the internal parts of the human body in wax by the late Dr. Chovet from No. 1 to No. 8 inclusive.
>
> Dried preparations by the late Dr. Chovet and others from No. 1 to No. 93 inclusive.
>
> Preparations of different parts of the human body in Spirit of Wine, by the late Dr. Chovet and others from No. 1 to No. 60 inclusive, and
>
> Three Castings in Gypsum, and eighteen Paintings in crayons; presented by Dr. Fothergill of London.
>
> Saml. C. Hopkins.

At my request Miss Florence M. Street, the librarian at the Pennsylvania Hospital, copied the list of preparations that were receipted for by Samuel C. Hopkins, in 1806:

PENNSYLVANIA HOSPITAL
ANATOMICAL MUSEUM

IMITATIONS OF THE INTERNAL PARTS OF THE HUMAN BODY, IN WAX, BY THE LATE DR. CHOVET

1. The figure of a man, completely dissected, placed in a supine position, on a table, exhibit-

ing all the blood vessels injected, and all the viscera in the cavities of the thorax, and abdomen in their natural situation, so contrived that each viscus may be separately examined. Copied from a dead subject six feet in length.

2. The body of a pregnant woman with the abdomen and uterus opened, in order to show the true situation of the foetus *in utero* with the membranes inclosing it, the placenta and the *funis umbilicalis*. Copied from a subject that died before delivery, within a month of her full time.

3. A child dissected, so as to exhibit the brain, with the nerves throughout the body, with the arteries and veins.

4. The female organs of generation, in their adult state. Copied from nature.

5. An imitation of the bust of a man of full size, displaying the muscles of the head and face, the parotid glands, salivary ducts and blood-vessels. The scull appears removed to show the brain invested with its meninges, and also, its intestinal convolutions when they are removed. The brain may be taken from the scull to view its inferior surface or basis.

6. A full grown foetus.

7. A gravid uterus extracted from a subject, who died in labour near her full time, laid open to shew the foetus in the position for delivery.

8. The accurate imitation of a new born child that expired soon after its birth, with the placenta and umbilical cord injected; the abdomen laid open to demonstrate the manner in which the foetus *in utero* is supported alive.

DRIED PREPARATIONS, BY THE LATE DR. CHOVET

1. An adult subject with the arteries and veins injected, and muscles preserved.

2. A young subject injected.

3. A child with the arteries injected and nerves dissected, for a demonstration.

4. A preparation of a child, exhibiting arteries injected and nerves, with some of the viscera injected.

5. The skeleton of an adult.

6. Ditto of a foetus.

7. The bones of the lower extremity, with an exostosis of the os femoris.

8. The arm injected.

9. The bones that compose the articulation of the humerus, with the ligaments.

10. Scapula to show the periosteum.

11. Spine of a child, with the nerves that proceed from it.

12. Pelvis of a foetus, with the arteries and veins injected.

13. Trachea of a child.

14. Female organs of generation in their natural situation in the pelvis.

15. Organs of generation of a child.

16. Ditto of a girl.

17. Uterus injected.

18. Organs of generation of a boy, with the kidneys and arteries injected.

19. Penis and bladder of a man in their natural situation with respect to the pelvis.

20. A penis opened, laterally, to show the internal cavernous structure.

21. Ditto, with sections in different places.

22. A human bladder.

23. Stomach and all the intestines of a child.

24. Small intestines with the mesentery injected.

25, & 26. Part of the small intestines of a child, with the mesentery.

27. Part of the caecum and colon, with a section to show the valve.

28. Part of the duodenum, with its duct.

29. Portion of intestine exhibiting the valvulae conniventes.

30. Ditto of the small intestines.

31. Stomach and colon injected.

32. Stomach injected.

33. Diaphragm.

34. Diaphragm and liver.

35. An injected kidney.

36. A diseased spleen injected.

37. An injected kidney.

38, 39, & 40. Diseased lungs injected.

41. Lungs with their blood-vessels injected.

42. The heart and lungs of a foetus in their natural situation in the thorax.

43. Heart of a child injected.

44. Incomplete preparation of the heart.

45, 46, & 47. Different preparations of the heart to show its internal cavities.

48. Heart moulded in wax to show the ventricles.

49. A portion of injected artery, with accompanying vein.

50. An eye with all its muscles.

51. An imitation of the eye.

52. A preparation of the ear.

53. All the bones of the ear.

54. Transverse section of the cranium, with the muscles, arteries and nerves of the neck.

55, & 56. The scull divided by a longitudinal section to exhibit the dura mater and its processes.

57. Part of a scull, with the basis of the brain in wax.

58. Scull of a man.

59. Ditto of a boy.

60. Ditto of an infant.

61. Several separate bones of the cranium.

62. Articulation of the hip.

63. A portion of injected skin.

PREPARATIONS OF DIFFERENT PARTS OF THE HUMAN SUBJECT, IN SPIRIT OF WINE, BY THE LATE DR. CHOVET

1, & 2. Diseased lungs.

3. Ditto injected.

4. Diseased liver.

5. Diseased lungs.

6. Integuments of the cranium.

7. Dura mater.

8. An injected ear with another uninjected, for comparison.

9. A childs face.

10. Part of a child's face injected.

11. A calf's nose opened to show the olfactory nerves.

12. The tongue and lower jaw, etc., to exhibit the structure of the fauces.

13. A tongue injected.

14. Part of the lower jaw, to demonstrate the second set of teeth.

15. An uterus with a diseased ovarium.

16. A full grown foetus, injected by the umbilical vein.

17, & 18. Small foetus.

19. An injected kidney.

20. An uncommon kidney.

21. A diseased kidney injected and macerated.

22. Kidneys, heart, etc.

23. A heart opened to show cavities.

24. Part of a large vein, showing the valves.

25. Part of the artery of an ox dissected, so as to exhibit the different coats.

26. A portion of the cuticle.

27. The cutis and cuticle.

28. Skin and cellular membrane separated.

29. A portion of skin of full thickness.

30. Palm of a child's hand injected.

31. A portion of the sole of the foot.

32. A diseased prostate gland with the muscular coat of the bladder much thickened.

33. A diseased bladder.

34. Lower part of the rectum.

35, & 36. Portions of the large intestines opened to show their internal surface.

37, & 38. Parts of intestines injected.

39. Ditto exhibiting the valvulae conniventes.

40. Part of an intestine injected.

41. Part of the mesentery.

42. Stomach of a child injected.

43. Bones of the fore arm of a child to exhibit the periosteum.

44. An arm partly dissected to show the muscles.

45. Two foetuses; presented by Dr. Cooper.

46. A large worm extracted from the abdomen of a dog; presented by Dr. Cooper.

47. An aneurismatic artery.

48. A foetus without lower extremities, presented by Dr. Disborough.

49. The tendons of a mortified leg.

50. A wen dissected from the neck of a patient in the hospital.

51. Lower part of the rectum opened to show its internal coat.

52. Ossified testes; presented by Dr. Cooper.

53. Tubili of the testes injected with mercury.

54. Two large lumbrici.

55. A taenia of great length.

56. Female organs of generation.

57. Preparations to show the cauda equina.

58. An enlarged ureter.

59. Fallopian tube with a small hydatid at the end of it.

60. A tumor extirpated from the face and neck of a patient in the hospital.

In reply to a request that special search be made for specimens contributed by Dr. Shippen, Miss Street wrote me as follows:

> I have searched the old catalogues of the Medical Library and the Museum but can find no mention made of specimens contributed by Dr. Shippen. Following No. 63, the following note is inserted: "To which are added the following, prepared & presented by different persons:"—Nos. 64, 65, 66, and 67 were presented by Dr. Parke, 68 by Dr. Cox, No. 83 by Dr. Horsfield, Nos. 89, 90, & 91 by Dr. Robert Carter, and No. 92 by Dr. Hartshorne. These are the only donors whose names are given.

From this list we learn that nearly the whole of the working museum consisted of preparations made by Chovet. Evidently Dr. Shippen was not as practical an anatomist as Chovet. If Dr. Shippen had possessed any of the spirit of his great teachers, John Hunter, William Hunter and William Hewson, it seems as though at this time his name would have been associated with some one of these preparations. It was not until the time of Wistar that any steps were taken towards the establishment of a permanent museum in connection with the department of anatomy at the University of Pennsylvania. The present collection, housed in the Wistar Institute, is the direct result of the labor of Wistar and his successors.

Chovet's collection first passed into the possession of the Pennsylvania Hospital and later was transferred by the hospital to the University. Thinking it might be of interest to photograph some of the preparations, correspondence was opened with the present director of the Wistar Institute, only to meet with disappointment. Dr. Greenman made a most careful search and the result is embodied in the following letter:

> February 25, 1909.
>
> My dear Doctor Miller:
>
> I had a curious hunt for the specimens made by Doctor Chovet. From the catalogue, Doctor Stotsenburg sent me the enclosed list which, he says, were entered before 1850, and there seems to be no trace of any of these specimens in the University or the Wistar Institute. I presume they were among some specimens which were destroyed by fire some years ago, 1888, I believe.
>
> Regretting that I cannot furnish you more satisfactory data, I am
>
> Yours sincerely,
> M. J. Greenman.

Following the publication of the original paper,[6] I received two letters which explained the failure to locate any of Chovet's preparations, and also confirmed Dr. Greenman's supposition that they were destroyed in the fire mentioned by him.

The first was from the late professor of anatomy at the University of Pennsylvania, George A. Piersol, and contained the following statement:

> By the way, you may be interested to hear, that in going over some old records of the fire in the Medical School, years ago, I found an item claiming for wax models destroyed, which were, probably, the ones you failed to locate in the Wistar and Horner Museum. . . . So it was the elements, and not the carelessness of our people, that effaced the interesting objects.

The second letter was from Dr. William Pepper. It gives in detail the wanderings of Chovet's collection after coming into the possession of the Pennsylvania Hospital. From his breezy letter the following abstract is taken:

> It is too bad that some of his wax models have not survived for us of to-day, but I do not think it is as strange a fact as you seem to think it, because possibly I am a little more familiar with the various vicissitudes that our collections have been through. When you think that these specimens were first in the possession of the Pennsylvania Hospital and that they were later turned over to the University of Pennsylvania while that Institution was on Ninth Street, and later moved to West Philadelphia about 1873 where in 1888 the Museum suffered greatly from a fire, and I can well remember as a boy that at that time watching the medical students, and others, throw models and specimens of various kinds from the third story windows to the great amusement of the spectators, and then later the moving of the Museum to the Wistar Institute; you must acknowledge that for wax models to have lasted through all this for 100 years would be, I think, rather wonderful.

The question: "What were the preparations and what became of them?" is now answered, and I think the reader will agree with me that the answer is "unsatisfactory." It is a matter of great regret that a collection, at one time the best in existence, for Chastellux says it "appears superior to that at Bologna," should have, through misfortune, completely disappeared. Evidently the lesson taught by the fire of 1888 bore fruit; for the present Museum is housed in a fireproof building.

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[6] *Anat. Record,* 1911, v, 147.

We have considered Chovet as an anatomist; it now remains to consider him in his individual character. Our compatriots of the time of the Revolution failed to understand him and his eccentricities. Nearly a century and a half have passed since his decease and no one has been able to penetrate the mystery that surrounds his life. It may be that some one in the future will be able to supply the much-needed information.

When Chastellux visited Chovet in 1780, he found him even more interesting than his anatomical collection:

> On seeing him, one can with difficulty conceive how so much patience and perseverance could consist with his natural vivacity; for it seems as if the sun of the tropics had preserved in him all the heat of youth; he speaks with fire, expresses himself as well in French as if he were still in our schools of surgery. In other respects, he is a perfect original: when the English were in Philadelphia he was a Whig, and has become a Tory since they left it; he is always sighing after Europe, without resolving to return, and declaiming constantly against the Americans, he still remains amongst them. His design in coming to this continent, was to recover his health, so as to enable him to cross the seas: this was about the commencement of the war; and, since that time, he imagines he is not at liberty to go, though nobody prevents him. He was to me a greater curiosity than his anatomical preparations, which appear superior to those of Bologna.

Chastellux gives here an example of Chovet's contradictions. A Whig while Philadelphia was occupied by the British forces, but a Tory before and after its occupation by the British; berating the Americans, he refuses to leave them. Chastellux, I think, understood Chovet better than his neighbors in Philadelphia.

Mention has been made of the friendship that existed between Chovet and Christopher Marshall. This friendship was to be put to the test; and, if I read the account rightly, the better spirit was shown by Chovet, the Tory.

Our Revolutionary compatriots were, to put it mildly, radical. The story of Dr. Kearsley is known to every reader of the history of the Revolution. Chovet, fearing a like treatment, sought protection at the house of Christopher Marshall, but was refused entrance. He hid in the hay in Marshall's stable and, though it was entered twice by searching parties, escaped detection. Late that night he announced his escape by tapping on one of Mr. Marshall's windows. In the process of time Philadelphia was occupied by the British forces and Mr. Marshall's property was in danger. Marshall himself fled the city; but his good friend Chovet, the Tory, took into his own house some of Mr. Marshall's personal property and preserved it for him. Marshall himself is authority for this statement. In his diary, under the date of August 27, 1778, the following entry appears: "Sent son's cart and horse to Dr. Chovet's and brought what books he had saved of mine at two trips to son's shop: left them up stairs there." I think the reader will agree with me that the Tory had the better spirit of the two.

Although Chovet was an outspoken Tory, in time the people in Philadelphia came to regard him as harmless. Watson, in his "Annals of Philadelphia and Pennsylvania" says: "The Doctor was termed a Tory; was licensed to say and do what he pleased, at which no one took umbrage."

Chovet was thoroughly English in his sympathy, and he never let slip an opportunity to joke his Whig friends. Watson, in the "Annals," tells the following story, which illustrates the quickness of Chovet's wit:

> Having been sent for by the Spanish minister Don Juan (I forget his name) who resided in old Mr. Chew's house, in Third, between Walnut and Spruce Streets, the weather being rather unpleasant, the ambassador ordered his carriage to the door to convey the doctor home—the

doctor, full of fun and joke, directed the coachman to drive by the Coffee-House, which, as he approached was perceived by the merchants, who immediately drew up in order, hats off, to pay their respects to the Don, as minister from a friendly power. The doctor kept himself close back in the carriage until directly opposite the Coffee-House; the gentlemen all bowing and scraping, when he pops out his head: "Good morning gentlemen, good morning; I hope you are all well; thank you, in the name of his majesty, King George," and drove off, laughing heartily at having again joked with the Philadelphia Whigs.

Abraham Chovet, m.d. (1704–1790). From the Etching by Rosenthal.

Norris tells the following story to illustrate his proclivity to use expletives in conversation:

> The doctor happened to be overtaken at the house of a member of the Society of Friends by a heavy shower of rain, and as he insisted on pursuing his way during its continuance, the friend kindly offered to loan him his overcoat, adding the condition that he was not to use hard words while it was upon his back, to which the latter assented. On returning the coat he was asked: "Well, doctor, didst thou swear whilst thou hadst on my coat?" "No!" replied he, "but there was a damnable disposition to lie."

The best character sketch of Chovet, as he appeared in his old age, is that given by Watson. I quote it in full:

> One of the earliest, and one of the most vivid recollections in this city, by the reminiscent, is of the person of old Dr. Chovet, living, at that time, directly opposite the (1842) "White Swan," in Race above Third street. He it was who by his genius, professional skill and perseverence finally perfected those wonderful (at that time) anatomical preparations in wax, which, since his death, have been in the possession of the Pennsylvania Hospital. These anatomical preparations, the very sight of which is calculated to fill the mind with solemn awe, while beholding not only the streets, but the lanes, alleys and inner chambers of the microcosm or little world of man, was beheld by the writer only some few years since, forcing back upon the memory the once aged appearance of the doctor, contrasted with the exertions made by him, and apparent to every one who beheld him to appear active and sprightly in business, cleaving as it were to his "Last sand." This aged gentleman and physician was almost daily to be seen pushing his way, in spite of his feebleness, in a kind of hasty walk, or rather shuffle; his aged head, and straight white hair, bowed and hanging forward beyond the cape of his black old-fashioned coat, mounted by a small cocked hat, closely turned upon the crown upwards behind, but projectingly, and out of all proportions, cocked before and seemingly the impelling cause of his anxious forward movements; his aged lips closely compressed (*sans* teeth) together, were in continual motion as though he were munching something all the while, his golden-headed Indian cane, not used for support, but dangling by a knotted black silken string from his wrist; the ferrule of his cane, and the heels of his capacious shoes well lined in winter time with thick woolen cloth, might be heard jingling and scraping the pavement at every step; he seemed on the street always as one hastning as fast as his aged limbs would permit him, to some patient dangerously ill, without looking at any one passing him to the right or left; he was always spoken of as possessing much sarcastic wit; and also, for using expletives in his common conversation, in the opinion of those who spoke on the subject, to be neither useful nor ornimental.

This picture of the old and faithful doctor is not a pleasant one. Evidently he no longer enjoyed the prosperity of former days. The fact that he always visited his patients on foot is not so surprising; it was the usual custom in those days. The especially well-to-do physician had a chaise; in these days he has his automobile. *Omnia mutantur, nos et mutamur in illis.*

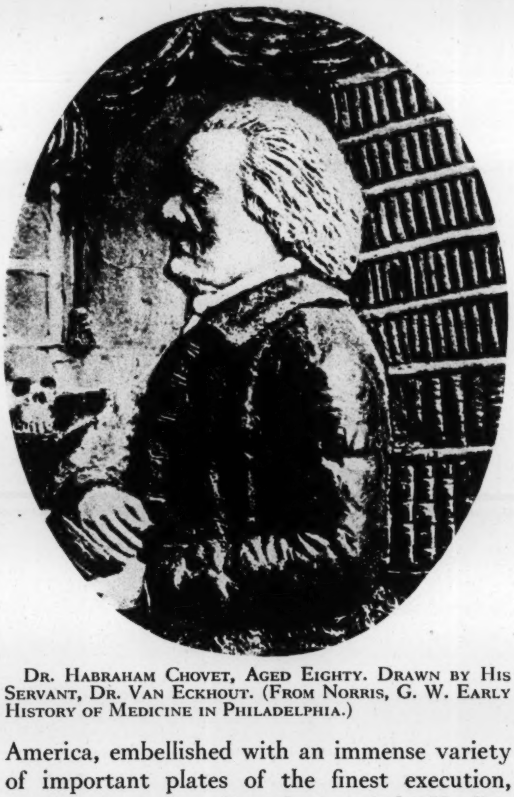
An etching, by Rosenthal, of the oil painting of Chovet by Pine, now in the possession of the College of Physicians of Philadelphia, is reproduced here. It was made in his younger days and shows him wearing a cheerful and animated expression. Through the kindness of Dr. G. W. Norris, of Philadelphia, I have been given permission to reproduce, from his grandfather's "Early History of Medicine in Philadelphia," the copy of the medallion portrait of Chovet mentioned in the early part of this sketch. This medallion was presented to the Pennsylvania Hospital in December, 1871, by Mrs. Mary Ann Marshall. It was originally given to Mrs. Marshall's grandfather, in 1793, by Chovet's daughter, Susannah Maria Penelope Abington. On the back of this medallion appears the inscription already given: "Dr. Habraham Chovet, born May 25, 1704; drawn May 25, 1784, by his servant Dr. Eckhout."

In the medallion portrait, Chovet is shown standing in his library and in the background there are shelves filled with books. Schöpf states that his collection of books was a notable one:

> Dr. Chovet, a learned old man of much reading, and in his 79th year full of life and enthusiasm, although not a Professor has at times lectured on Anatomy, his favorate study. He is particularly known for his beautiful wax-work collection, largely his own fabrication and designed to illustrate the parts of the human body. He has, in addition, a considerable number of fine anatomical preparations and a notable and rare collection of books.

In the issue of Dunlap & Claypoole's *American Daily Advertiser*, for January 21, 1794, the following advertisement of the sale by auction of Chovet's library appears:

> The Library of the late Doctor Abraham Chovet, of the city of Philadelphia, will be sold by public auction, at the store of the Subscriber, No. 95, Front near Walnut street, This Evening; being the greatest and most superb collection of Medical books, ever offered to public sale in America, embellished with an immense variety of important plates of the finest execution, worthy the notice of gentlemen of the Healing Art, together with a very valuable collection of books in Philosophy, History, Religion, Botany, Chemistry, Arts and Sciences, &c.
>
> Edward Pole, Auctioneer.



DR. HABRAHAM CHOVET, AGED EIGHTY. DRAWN BY HIS SERVANT, DR. VAN ECKHOUT. (FROM NORRIS, G. W. EARLY HISTORY OF MEDICINE IN PHILADELPHIA.)

The library of the College of Physicians of Philadelphia possesses a few books which bear Chovet's autograph; but none of those that I have seen are anatomical.

As a practitioner of medicine and surgery, Chovet was not without reputation. I quote again from Norris: "Dr. Coste, the chief medical officer of Rochambeau's army, in a tract which he published at Leiden, in

1784, speaks of Chovet as 'a man skilled in all things pertaining to medicine, and especially in anatomy and surgery.' "

Dr. Chovet appears as one of the characters in S. Weir Mitchell's "Red City." The story opens May 23, 1792, and closes in October, 1795, covering about three years and four months. The last time Chovet appears in the story is some time in August, 1795, when he is represented as fleeing from Philadelphia. As Dr. Chovet died March 24, 1790, it is difficult to understand how he could be a living character in 1792, and so active in 1795, that he could "flee the city." Chovet was eccentric but he did not deserve the ridicule to which S. Weir Mitchell subjected him throughout his "historical" novel. All my investigations into the life and character of Dr. Abraham Chovet confirm the statement made by Morton in his "History of the Pennsylvania Hospital": "His character and the high quality of his professional acquirements entitle him to high rank among the medical profession, and with them to respectful remembrance."

Only one honor came to Chovet during his residence in Philadelphia, and that was well deserved; it is recorded in Ruschenberger's sketch of Chovet: "Of the twelve senior founders of the College of Physicians of Philadelphia, Dr. Chovet is the only one who was not born in or near Philadelphia. At the time of forming the Society his years exceeded fourscore. At such an advanced age men are not invited to engage in a new enterprise unless their qualifications are eminent in the estimation of their colleagues." Strange to say, no record was made in the minutes of the proceedings of the College, of the death of Chovet, although he was one of the charter members.

Chovet was probably married in England, for the tombstone of his daughter, Mrs. Abington, tells us that she was born October 30, 1736, and died April 3, 1813. Chovet, his wife and his daughter are buried in Christ Church cemetery, Philadelphia.

Chovet said: "That physician is an imposter who did not live till he was eighty"; he died March 24, 1790, in the eighty-sixth year of his age.

The local newspapers of Chovet's time hardly considered any local news as worthy of space. It adds, therefore, to the reputation which Chovet had acquired, to find in the *Independent Gazetteer* for March 27, 1790, the following notice:

> Died on Wednesday last, in the 86th year of his age, the celebrated and facetious Doctor ABRAHAM CHOVET, and yesterday his remains were decently interred in Christ Church burial ground, attended by a very respectable number of citizens: He was a native of old England, and very eminent in his profession both as a physician and anatomist.

In the notice of his death which appeared in the *Universal Asylum and Columbian Magazine* for March, 1790, he is referred to as "an eminent anatomist and extraordinary man"; the notice goes on to say: "This aged physician for about half a century attracted the attention of persons of all ranks and classes, in different parts of the world."

Shortly before he breathed his last, he requested his family to give him a plain funeral, and by no means to have the bells rung for him, as was the custom at that time, because he did not wish to have sick people disturbed by such an unnecessary noise. He often had had no consideration for people in health; but the sick always fared well at his hands.

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[From Redi: Sonetti. Firenze, 1702.]

STUDIES IN PALEOPATHOLOGY XVIII*

TUMORS OF THE HEAD AMONG PRE-COLUMBIAN PERUVIANS

By ROY L. MOODIE, PH.D.

CHICAGO, ILLINOIS

ANTIQUITY OF MAN IN THE WESTERN HEMISPHERE

THE age of the Peruvian material described below may be best understood if we review here the chief facts of man's presence in ancient times. This will show the relatively recent rise of the Peruvian civilizations.[1] Compared to the Heidelberg man the pre-Columbian Peruvians are not ancient at all. The duration of their residence in South America may be measured by hundreds, or at most by a few thousand years. Investigations into the early Megalithic and pre-Megalithic civilizations of Peru are actively under way at the present time and we may look forward confidently to an improvement of our knowledge of Peruvian chronology.

Recent studies in European prehistory have made clear that the record of human existence may be divided into the following periods:

I. *Paleolithic*, with nine subdivisions, all belonging around the close of the Pleistocene, beginning 150,000 years ago. The Paleolithic, or Old Stone Age, is not certainly represented in the Western Hemisphere, although recent discoveries suggest an association of early man with certain extinct mammals.[2]

II. *Neolithic*, 7000–3000 B.C., with its subdivisions, is the oldest period of the recent epoch. Some of the groups of the early inhabitants of the Western Hemisphere seem to belong here, but much of the data is of a doubtful character.

III. *Bronze Age*, 3000–500 B.C. The ancient Peruvians under the Incas seem to have been in this stage of progress.

IV. *Iron Age*. 500 B.C. to the present.

Much eager interest in man's antiquity is being displayed by workers in many fields of science, and each new discovery is carefully scrutinized. One of the most recent finds is described by Stock,[3] but while these remains are ancient, there are no definite means of ascertaining just how old they really are. The probable age of the Los Angeles skeletons may be spoken of as several thousand years. Similarly, explorations of the shell mounds[4] of the Pacific Coast indicate that some of them may have occupied from a thousand to 3500 years in their formation, thus giving a slight clue to the extent of time man has been present in the Western Hemisphere. Many of the mounds seen in Southern California are so largely composed of wind-blown sand that a much shorter period than a thousand years may have been sufficient for their accumulation.

In Mexico, Yucatan and South America evidences of man's antiquity are still more uncertain, although active investigations are under way in all of these regions and as the evidence accumulates we will be more and more able to formulate substantiated opinions of man's antiquity in the Western Hemisphere.

PLE-COLUMBIAN VERSUS PREHISTORIC

The assemblage of material in San Diego consisting of Peruvian material dates from a period prior to the year 1532 or shortly thereafter. On account of intrusive burials some uncertainty is entertained about the actual date of all the material but most of the skeletons are definitely known to be prehistoric or early historic. This enables us to determine, so far as may be done from skeletal material alone, the nature of disease and injury prior to the coming of the white race.

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*The greater part of the cost of publishing the figures of this paper was met by a grant from the Committee on Scientific Research of the American Medical Association.

The contact of the Spanish invaders with the inhabitants of Peru introduced many disturbing factors into the reactions of the Peruvians to disease. For this reason I prefer the term pre-Columbian rather than prehistoric because it indicates the period before the coming of the white race and refers to the time when the Indians were masters of the regions they inhabited. Prehistoric events may be referred to in the same way but written history has not always had a relation to the coming of white people since archeology extends the historic period backward into previous times without reference to racial contacts. There is no good reason why historic events should be restricted to the period succeeding the invasion by a more cultured race. The records preserved by the Indians are as truly of historic value as the writings of the Spaniards. Everywhere the boundary between *historic* and *prehistoric* is changing. Pre-Columbian, however, as a term denoting a definite period, has a permanent value so far as it indicates a period prior to racial contacts which produced certain drastic changes in the immunity of the primitive races to disease. The term *prehistoric* is, however, so extensively employed in the literature that it may be regarded as the equivalent of *pre-Columbian* so far as the matter under discussion is concerned. In my writings *prehistoric* and *pre-Columbian* will be synonymous. Hrdlicka uses the term *prehistoric* almost exclusively in his catalogue of the Peruvian material at San Diego. Mead and others likewise prefer the term *prehistoric*.

THE COLLECTION AT SAN DIEGO

The following statements extracted from "A Descriptive Catalogue of the Section of Physical Anthropology, Panama-California Exposition, 1915" by Ales Hrdlicka (a fifteen page leaflet) will serve to explain the accumulation of Peruvian pathological skeletons at San Diego. It will not be necessary in other papers of this series to discuss the nature of the collection since the account is given in full here. This account has been printed only in the leaflet but since this was for local distribution it is considered worth while to place the discussion where it will be more generally available. This is the more important since the collection will be accurately described and illustrated.

Physical Anthropology constitutes not merely a highly absorbing field of study, but also a sphere which would lend itself to most interesting and instructive exhibits. It was in appreciation of this fact that, in 1912, Dr. Edgar L. Hewett, Director of Exhibits, with Col. D. C. Collier, then President of the Panama-California Exposition, called on the writer for plans of what could be accomplished in this line before January 1st, 1915, the date set for the opening of the Exposition.

When the proposition was taken up, it was seen at once that there would be but little precedent to follow in the planning and formation of the exhibit. No comprehensive exhibits in Physical Anthropology had ever been attempted, though at a number of expositions, from that in Paris (1878) to that in Dresden (1911), the subject of Man received considerable attention and there were sections devoted in part to Anthropology. The scheme of the contemplated exhibit would therefore have to be original. It was further realized that available data and material were not sufficient for larger systematic high-class exhibits, and that a number of collecting and scientific expeditions to different parts of the world would be necessary in order to supply these deficiencies. Thus the plans had to be extended to include a large amount of field work.

The general scheme was finally reduced to what appeared the most practicable form and thus accepted by the representatives of the San Diego Exposition. In order to secure rigid attention to the many important details, insure the highest value of the exhibits, and safeguard the administrative and financial details of the large undertaking, an agreement was reached between the Exposition and the Smithsonian Institution, whereby the latter undertook the disbursement of the fund allotted for the work; and the writer was intrusted with the actual carrying out, as far as feasible, of the plans that were accepted. In compensation for the various facilities afforded by the Smithsonian Institution and the services of the writer, the U. S. National Museum was to profit by such scientific data and material, gathered on the proposed expeditions, as would be left after the wants of the Exposition were satisfied.

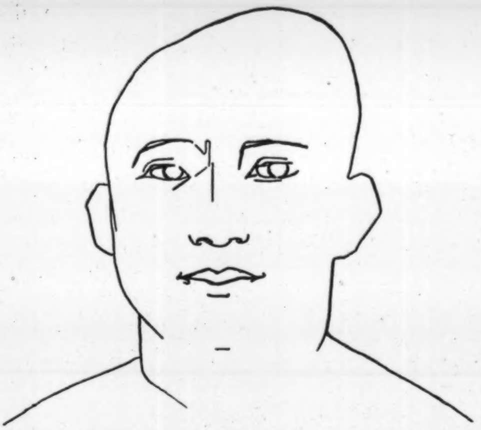

FIG. 1. DEFORMATION OF THE HEAD BY HYPEROSTOSIS. THE MAJORITY OF THE TUMORS OCCUR ON THE LEFT SIDE. THIS FACT HAS BEEN WIDELY COMMENTED UPON BUT NO ADEQUATE EXPLANATION HAS BEEN GIVEN AS TO WHY THE NEOPLASMS MORE OFTEN AFFECT THIS SIDE IN PREFERENCE TO THE RIGHT. OUTLINE ADAPTED FROM PHOTOGRAPH OF PATIENT WHOSE CASE IS DISCUSSED BY PHEMISTER.

The plans decided upon comprised, in brief, original exhibits, of permanent Museum value, covering as far as possible the whole scope of Physical Anthropology as outlined in the Introductory paragraphs of this Catalogue. They were to be housed in five connected rooms and to illustrate man's origin in the light of modern science, his relation to the rest of the animal kingdom, and, in comparative manner, his life cycle and its variations. It is gratifying to know that in the main these plans have been realized. In some particulars untoward circumstances, and especially the European war, have interfered with the work, in a few directions preventing even the attainment of such completeness in the exhibits as was contemplated; but these deficiencies, of which only the Preparator will be fully conscious, have already been partly compensated for and will be further done away with during the course of the Exposition.

To get the needed original and thoroughly authentic documents, photographs and casts, with skeletal and other material, visits were made to all the more important European museums, and expeditions were organized to ancient mounds, caves and cemeteries, as well as to the most primitive living peoples in different parts of the world.

Another important expedition was made to the ancient ruins and cemeteries of Peru, for the purpose of obtaining skeletal material for various exhibits, particularly such as would illustrate the prehistoric pathology and surgery of the American aborigines. This expedition, by the Preparator, yielded rich results which contribute largely to the exhibits in Room IV. These exhibits represent by far the most complete display of native American material of this nature and are of special medical and surgical as well as anthropological value.

For Americans, and for medical men in general, a subject of great interest is that of the diseases that have existed on this continent among the aboriginal tribes before the advent of the whites. To obtain a complete knowledge of the same is of course hardly possible; but many of the pathological processes of the prehistoric Indian have left their traces on his bones, and if enough of these could be had for examination, we could expect to obtain fairly clear and extended information of the prevailing morbidity and causes of death among those aborigines. There is only one region on this continent which offered to the medical man hopes of success in this direction. That region is Peru where up to recent times, due to the cupidity of the common people, a great many of the prehistoric Indian cemeteries have been excavated to obtain the pottery, ornaments, etc., that were buried with the bodies. As a rule in these cases the skeletal remains found in the graves would be left scattered in and on the sands, to be slowly destroyed by the elements. Many hundreds of such despoiled cemeteries existed along the Peruvian coast up to a very recent time, and the unequaled occasion was utilized for the San Diego Exposition. In 1913, the writer made an extended trip along the coast and into the mountains of

Peru.* Scores of old cemeteries and burial caves were found and all the exposed skeletal material, consisting of approximately 4,800 crania and a very large quantity of other bones of the skeleton were examined for pathological conditions. All the interesting specimens that were still in fair condition of preservation were secured, and they now form in Room IV a rich and valuable, in fact unique, exhibit in prehistoric American pathology.

Included with the pathological specimens are a series of sixty crania, from the western mountains of Peru, showing in many forms old operations on the skull, or trepanations. These operations, it was learned conclusively, were performed for purely surgical reasons. The people fought with arrows, clubs, maces and slings, and the resulting wounds of the head, if not fatal, left generally depressions or other lesions in bone, which often must have given rise to serious symptoms. The medicine men of the ancient Peruvian (and some other) Indians learned in some way that by removing the depressed or partly driven-in bones, they would relieve the symptoms and not seldom even cure the patient completely, and from this there was but a short step towards a systematic practice and further development of such operations. In many cases these operations were remarkably successful, as shown by the absence of signs of infection, and the growth of normal bone in and about the wound; in other instances the edges appear clear cut and show little or no sign of healing. In some of these latter cases the subject was in all probability operated on too late, or as a last resort and did not survive, while in others he lived but a few days or weeks, dying from the results of his original injuries. The trepaning was done with stone, obsidian or copper knives, and was effected by scraping, cutting, or drilling (very rare) the bone, or by combination of two or more of these methods. No part of the vault was evidently considered too dangerous for an operation; and on some skulls there are remains of two and even more trepanations made at one or at different times. When the hole made was very large and the brain tended to protrude, a stopping plate, made of a gourd, shell, and in some rare cases even metal (silver), was used. To deaden the pain of the operation the natives of Peru and Bolivia used doubtless coca leaves, the chewing of which was habitual in these countries. Besides

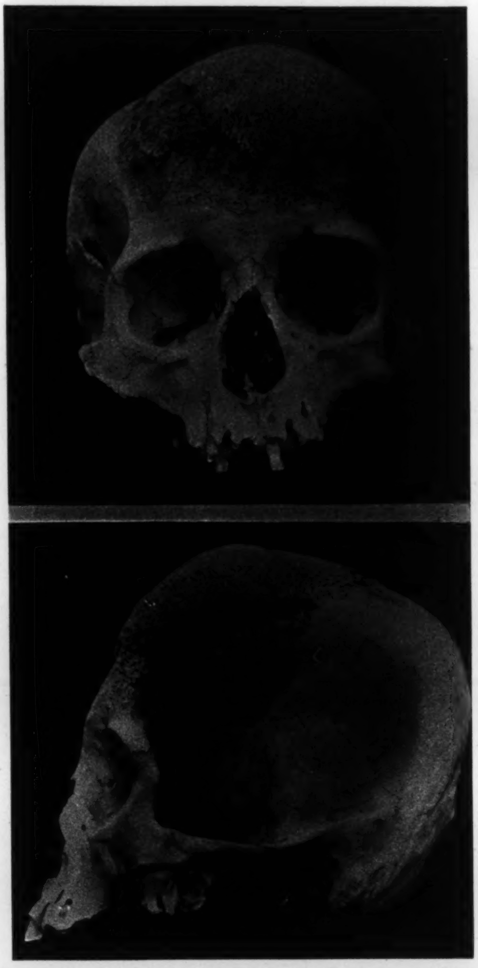

FIG. 2. PRE-COLUMBIAN HYPEROSTOSIS CRANII FROM PERU.

a. FRONTAL ASPECT OF A SKULL, POSSIBLY FEMALE, SHOWING FULLY FORMED LESIONS DOUBTLESS DUE TO THE PRESENCE OF A MENINGIOMA DURING LIFE. THIS SPONGE-LIKE TUMOR COVERED THE GREATER PART OF THE FRONTAL REGION TO WITHIN A FEW MILLIMETERS OF THE ORBITAL MARGINS, BUT THE ANTERIOR SPICULES HAVE BEEN LARGELY BROKEN AWAY AS A CLOSE EXAMINATION OF THE PHOTOGRAPH WILL REVEAL. THE TUMOR-MASS IS MORE STRONGLY DEVELOPED ON THE LEFT, HAVING EXTENDED WELL DOWN INTO THE LEFT TEMPORAL FOSSA, BUT HAD NOT INVADED THE RIGHT FOSSA AT ALL. THIS IS IN AGREEMENT WITH CLINICAL FINDINGS IN MODERN MENINGIOMAS. THE PATHOLOGICAL GROWTH OF BONE IS, IN APPEARANCE, SINGULARLY LIKE CERTAIN CORALS, BUT LACKS THE RADIATE SYMMETRY. SKULL NO. 158 OF THE SAN DIEGO MUSEUM OF ANTHROPOLOGY, IN BALBOA PARK. COLLECTED NEAR CHAVINA, PERU, BY ALES HRDLICKA.

b. THE SAME SKULL SHOWING EXTENT OF HYPEROSTOSIS ON THE LEFT SIDE. THE HEIGHT OF THE BONY MASS IS ALSO EMPHASIZED IN THIS VIEW.

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* For a detailed report of this journey see Hrdlicka, A. Anthropological work in Peru in 1913, with notes on the pathology of the ancient Peruvians. *Smithson. Misc. Coll.*, Wash., 1914, LXI, No. 18.

this, the Indians possibly knew and used other analgesic or narcotic plants.

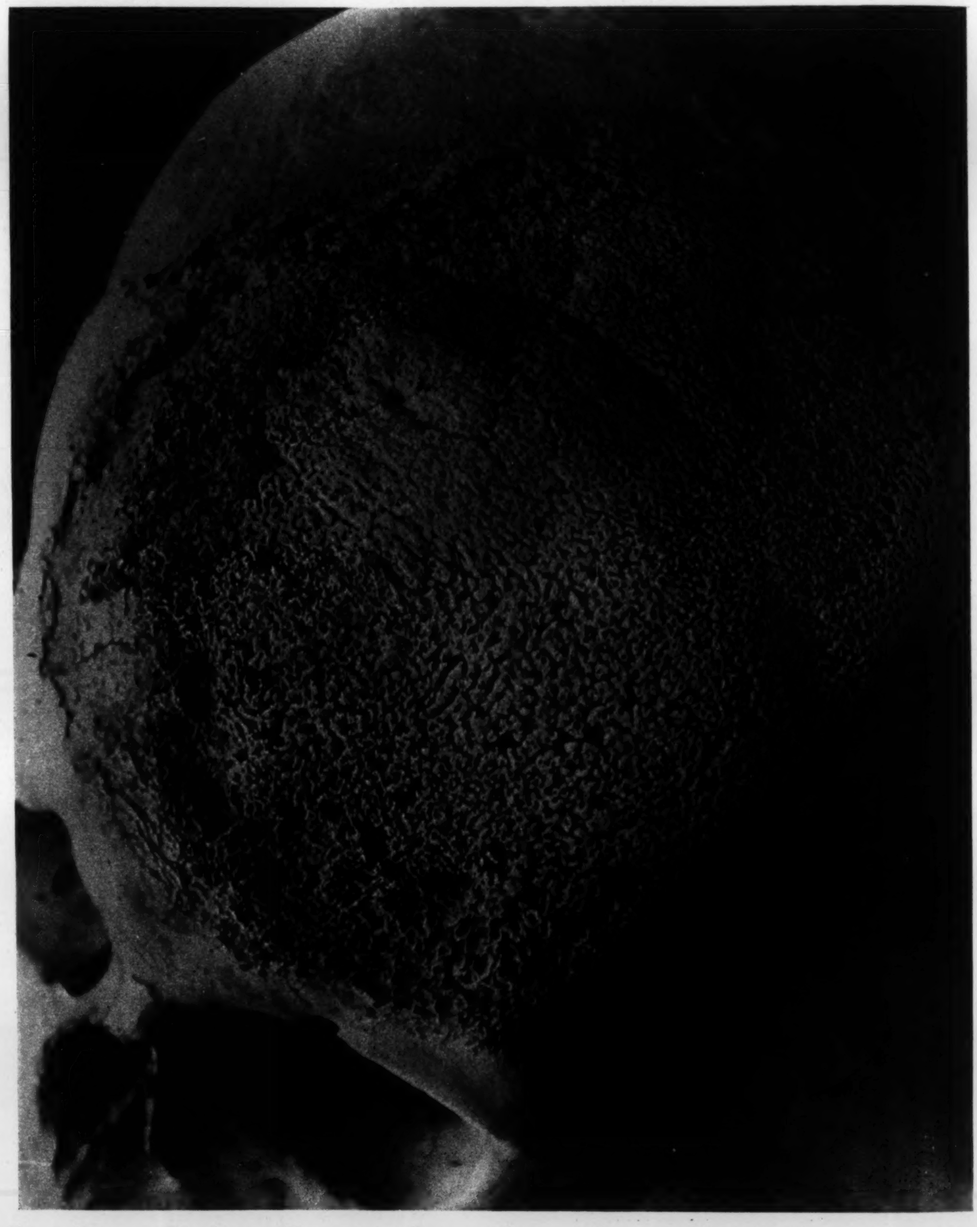

Fig. 3. Enlarged View of the Hyperostosis Shown in Figure 2, Seen from Above. The Agreement between the Appearance of this Cranial Hyperostosis and Certain Commercial Sponges is Quite Striking. The Resemblance is, of Course, Accidental and Probably Meaningless. It Is Interesting to Compare This Figure with the Photographs of the Florida Wire Sponge, Plates lviii and lix in "The Commercial Sponges and the Sponge Fisheries" by H. F. Moore (*Bull. of the Bureau of Fisheries*, 1908, xxviii, Pt. 1, p. 403).

A typewritten catalogue of 979 specimens, consisting of Hrdlicka's brief field notes with determinations of sex, forms the guide to the study of the collection. I am indebted to Miss Margaret Bard, assistant curator, for a copy of this catalogue.

A large amount of the material collected in Peru in 1913–1914 is preserved in Washington, D. C., at the United States National Museum. This is largely normal. There are 3651 skulls, of which 1838 are male and 1813 are female. These crania show slight pathological changes, intentional deformation (aymara and fronto-occipital), trephining, and injuries, but over 3000 of them show no changes at all. Osteomas of ivory-like consistency, located in the external auditory meatus, are abundantly represented in the collections at Washington. Acromegaly is indicated by a huge skull in which the pituitary fossa was enlarged. One skull exhibits a ring-like lesion which may be a metastatic carcinoma. There are several thousand jaws, some of which might be matched to skulls, but a very few are associated. The vertebrae and limb bones are not articulated; most of them having been gathered from disturbed burials. Hundreds of trays full of prehistoric Peruvian limb-bones, sacra, pelves, et cetera, on cursory examination show no pathology or only slight changes. The femora have been sexed and catalogued. Sacralization is evident on several sacra, but no detailed study of this has been made. Atlases conjoined to occipital condyles are displayed. Some of the pelves show arthritis deformans. One of them, a female from Chicama, is extremely light and fragile. The acetabulum is quite deep, practically circular, edges sharp, with a diameter of 60 mm. The normal articular surfaces are not obvious, the entire acetabulum being pathological. There are, of course, other collections of prehistoric Peruvian material but they contain only rare pathological elements. The collection at San Diego is a segregation of the most obviously pathological bones obtained by Hrdlicka. They were placed in the museum for the specific purpose of forming an exhibit of pre-Columbian pathology. As such it forms a primary center for the study of the paleopathology of Peru. It doubtless contains examples of most of the pathological changes which may be recognized from skeletal elements alone.

THE COASTAL INDIANS OF PERU

If we may judge from the existence of hundreds of prehistoric cemeteries along the coast, this part of Peru must have been inhabited by an abundant population since early times. They were doubtless attracted to the well-watered valleys by the agricultural possibilities which they enhanced by irrigation. Portions of the prehistoric irrigating canals are still to be seen. Although large collections have been made from the coastal cemeteries no one has studied the physical anthropology of the prehistoric people with the care that MacCurdy[5] has devoted to the Peruvians of the highlands. Hrdlicka[6] says that "the whole coast of Peru, at least from Pisco well south of Pachacamac, to Pacasmayo north of the valley of Chicama, was peopled by one and the same type of natives, the brachycephalic (short headed) Indian of moderate stature." It is probable that the present-day Indians are the direct descendants of the prehistoric people since the present Indian population shows the same physical characters, at least as far south as the southern boundary of Peru. "The present Indians of Peru and Bolivia may be described as of moderate stature, the men measuring between 5 feet

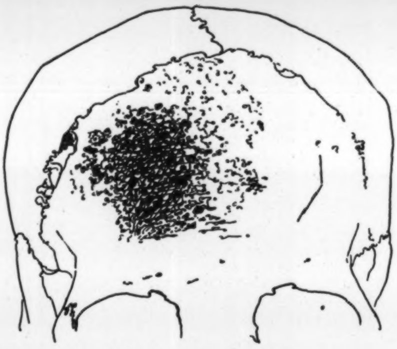

FIG. 4. PRE-COLUMBIAN SKULL FROM ANCON, PERU. FEMALE. AN ERODED AREA 50 MM. IN DIAMETER IS PRESENT ON THE RIGHT FRONTAL. THIS MAY HAVE BEEN DUE TO A TUMOR IN THE SCALP SINCE THE INNER SKULL TABLE IS NOT AFFECTED. IT MAY ALSO BE AN EARLY STAGE IN THE DEVELOPMENT OF A CRANIAL HYPEROSTOSIS DUE TO A MENINGIOMA. SKULL UNDEFORMED BUT WITH THE LEFT MAXILLA ALMOST COMPLETELY DESTROYED BY A HUGE ABSCESS, MEASURING 45 MM. IN LENGTH, EXPOSING THE MAXILLARY SINUS. NO. 157 OF THE SAN DIEGO MUSEUM OF ANTHROPOLOGY, BALBOA PARK. SEE ALSO FIGURE 5.

2 inches and 5 feet 3 inches, the women about 2 inches less" (Mead). All of the skulls exhibiting tumors, which are described in this paper, were collected near the coast, at Nasca, Chavina, Ancon, Chicama, Cinco Cerros, and so forth. See the map for relation of these localities to Lima.

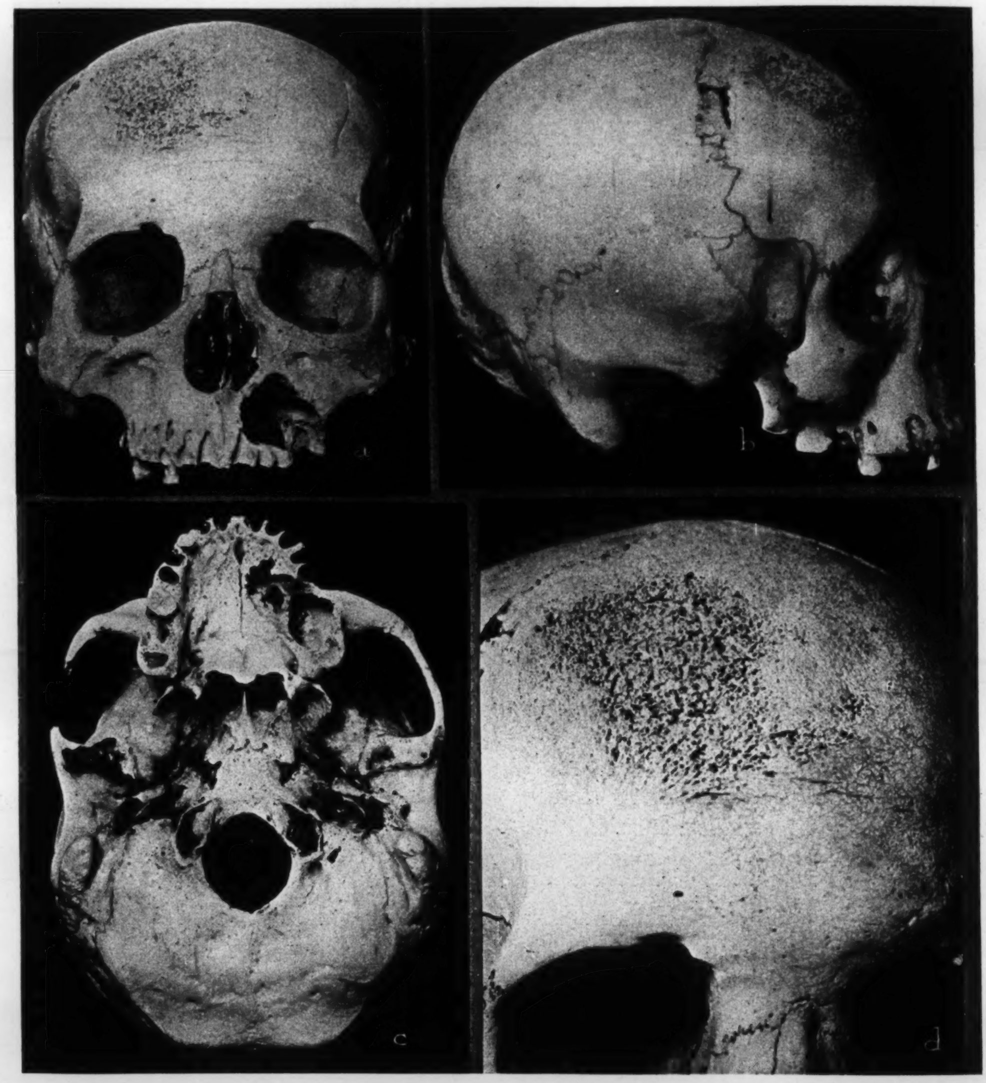

FIG. 5. SKULL NO. 157, FROM ANCON, PERU, SHOWING TWO PATHOLOGICAL AREAS THOUGHT TO BE DUE TO TUMORS. SPECIMEN IN BALBOA PARK, MUSEUM OF ANTHROPOLOGY, SAN DIEGO, CALIFORNIA.

a. FACIAL VIEW SHOWING LESIONS ON RIGHT FRONTAL AND LEFT MAXILLA. SKULL OTHERWISE NORMAL. THE BONES ARE HARD, WHITE AND FIRM.

b. RIGHT LATERAL ASPECT OF SKULL SHOWING DISEASED AREA OF RIGHT FRONTAL AND A POST-MORTEM PERFORATING INJURY ON THE RIGHT CORONAL SUTURE. THIS SKULL IS UNUSUALLY SYMMETRICAL.

c. BASE OF SKULL SHOWING ESPECIALLY THE PATHOLOGICAL CONDITION OF THE PALATE, SHOWN IN DETAIL IN FIGURE 6. THE DEFECT THOUGHT TO BE DUE TO A SOFT TUMOR IS SEEN ON THE RIGHT OF THE PICTURE.

d. DETAILED VIEW OF LESION ON FRONTAL THOUGHT TO BE AN EARLY STAGE IN THE DEVELOPMENT OF AN HYPEROTOSIS CRANII ABOUT NATURAL SIZE.

A list of prehistoric Peruvian skulls, showing tumors of the head, collected and catalogued by Ales Hrdlicka and now preserved in the Museum of Anthropology, Balboa Park, San Diego, California, follows:

No. 108. Prehistoric skull from Nasca Region, Peru. Bony tumor at bregma.

No. 109. Prehistoric skull from Huacho, Peru. Male. Bony enlargement with numerous canals of enlarged blood vessels about bregma.

No. 158. Prehistoric skull from Chavina, Peru. Female? Osteoporotic tumor involving externally most of the frontal and parts of the parietals. Rare specimen, possibly unique.

No. 179. Prehistoric skull from Chicama, Peru. Male. Bony tumor on the left parietal eminence.

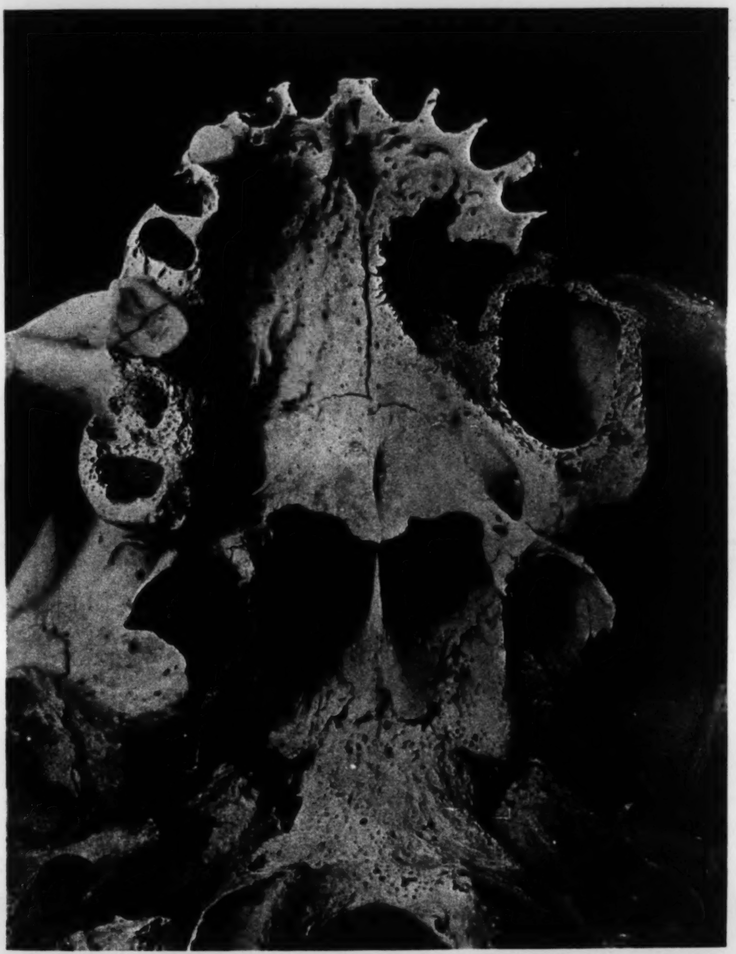

FIG. 6. FEMALE SKULL NO. 157 AT BALBOA PARK, MUSEUM OF ANTHROPOLOGY, SAN DIEGO, CALIFORNIA. AN ENLARGED VIEW OF THE PALATE SHOWING ESPECIALLY THE PALATAL DEFECT IN THE RIGHT MAXILLA THOUGHT TO REPRESENT PRESSURE EROSION BY AN UNKNOWN TYPE OF TUMOR. A DISCUSSION OF THE ALVEOLAR AND DENTAL DISTURBANCES WILL BE DEFERRED TO A SPECIAL STUDY OF THESE LESIONS.

No. 110. Prehistoric skull from Cinco Cerros, Peru. Female. Pronounced bony tumor to the left of bregma.

No. 111. Prehistoric skull from San Damian, Peru. Male. Bony tumor in front of bregma.

No. 157. Prehistoric skull from Ancon, Peru. Female. Large soft tumor involving the left upper maxilla. Rare specimen.

No. 210. Prehistoric skull from Ancon, Peru. Female. Marked enlargement, involving the whole lower portion of the frontal on the left side, possibly due to a cyst or other pathological condition in the left supra-orbital sinuses.

No. 264731. Large male, prehistoric skull from Chicama, Peru. There is a wide area of hypertrophy, of the osteoporotic type, 100 mm.

in diameter, on the posterior part of the right parietal. This looks so like the lesion presented by skull No. 158 that I have no hesitancy in stating this to be an early stage in the growth of an hyperostosis cranii. The inner skull table is affected as in No. 158. The skull is badly weathered and imperfect. The outer part of the bone has scaled off from the surface of the lesion revealing porosities in the elevation, which were doubtless filled with tumor cells during life.

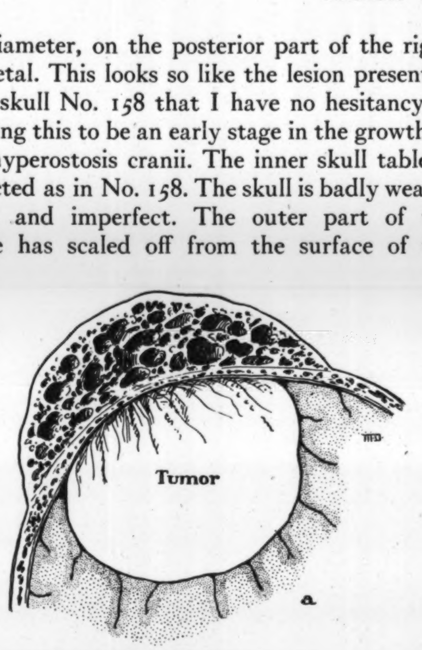

Fig. 7. *a.* A Possible Relation of a Broad Meningeal Tumor to the Skull on Which an External Hyperostosis Has Developed. The Vacuities in the Bone Are Filled with Tumor Cells. The Inner Skull Table Is Largely Eroded. Other Possibilities Are Sketched by Cushing but the Present Diagram Explains the Hyperostosis Cranii in the Pre-Columbian Skull Described Herewith. The Peruvian Skull Shows Slight Changes of the Inner Table. Modified from Cushing. (Meningiomas. *Brain,* xlv, 28.)

b. Another Possible Relation of a Pedunculate Meningeal Tumor to the Skull and Brain. It Is Doubtful if Such a Large Hyperostosis Cranii Would Develop as a Result of the Slight Contact Shown but This Would Probably Depend on the Degree of Pressure Exerted by the Tumor Mass Which in This Case Would Be Severe. Modified from Cushing (*loc. cit.,* p. 11). His Case, However, Had Developed No Hyperostosis, either External or Internal.

Types of Tumors

I have chosen in this study to discuss only the hyperplastic effects of tumors on the head. There are doubtless examples in the collection of other kinds of tumors. The types are shown in Figures 2 and 12. I thought at one time that the bony tumors shown in Figure 12 *a*, *b* and *d* might be early stages in the growth of a cranial hyperostosis produced by a slowly growing meningioma. Their sizes are progressively larger and their positions suggested this type. The inner skull table of all, examined by flashlight through the foramen magnum, shows little or no change. There is no external evidence of trauma in Skull No. 111 (Fig. 12*a*) the smallest of the tumors. The crater-like depression on Skull No. 110 (Fig. 12*b*) may be the trauma responsible for the growth or it may be an injury to a slow growing hyperostosis cranii. The tumor on Skull No. 179 (Fig. 12*d*) gives no evidences on which an interpretation might be based. It may be due to a meningioma or other cause. The tumor above the orbital cavity of Skull No. 210 is undoubtedly a cancellous osteoma. The hyperostosis cranii shown in Figures 2 and 3 is unquestionably due to a meningioma and probably the tumor mass in Figure 10 is an advanced stage of a hyperostosis cranii. I have departed from my plan of discussing only the hyperplasias to introduce a brief account of certain pathological changes in Skull No. 157 because of their probable relation to hyperplastic changes. The lesion of the frontal (Fig. 5*d*) may be an early stage in the growth of an hyperostosis cranii, from which the delicate needle-like spicules of bone have been removed by the abrasion of contact with sand or other substance, or by exposure to the weather.

Historical Sketch

It will not be of great service here to go extensively into the history of medical opinion regarding the hyperostoses cranii. The appearance of the tumors is sufficiently striking to have engaged the attention of the morbid anatomists from early times and Cushing[7] has discussed the literature since Cruveilhier. Many of the early interpretations were as diverse as the appearance of the objects and there was no accepted classification. It is interesting to note that Baillie,[8] in describing John Hunter's collection, figured on Plate 1 of Fasciculus x, an adult skull showing evidences of what seem to be hyperostoses cranii:

> The masses consist of bony excrescences which assume a sort of oval form. The lesions are composed of bony spicules resembling certain crystallizations, which grow from the outer and also from the inner surfaces of the cranium. The original bone of the cranium at these places is absorbed, and in this disease a double process would appear to be going on at the same time, viz., the absorption of the original bone, and the formation of new bone in the spicula or crystals. Of the nature of this disease nothing is accurately known, but it has been sometimes regarded as cancerous.

More recently the condition has been discussed by Penfield,[9] who recorded many interesting findings in a large series of cases. Sternberg[10] and Cope[11] have described the local conditions in other cases.

RELATION OF MENINGEAL TUMORS TO CRANIAL HYPEROSTOSES

The tumors described in this study are almost entirely confined to the outer skull table and in six out of the nine skulls which I have selected for study the tumors occur adjacent to the bregma. Three of these are on the right and three on the left of the median line of the skull and no skull shows more than one tumor. It is clearly realized, of course, that the diagnosis in a prehistoric skull of a hyperostosis due to a meningioma is largely conjectural and is based on the appearance of the neoplasm in the bone. They may all be due to intracranial changes or they may be due to diverse and somewhat obscure causes. It is thought best to ascribe the definite cause of meningioma to the growth of the new bone in Skull 158 from Chavina, Peru, and in MacCurdy's specimen from Paucarcancha. But while other tumors may be early stages in the growth of cranial hyper-

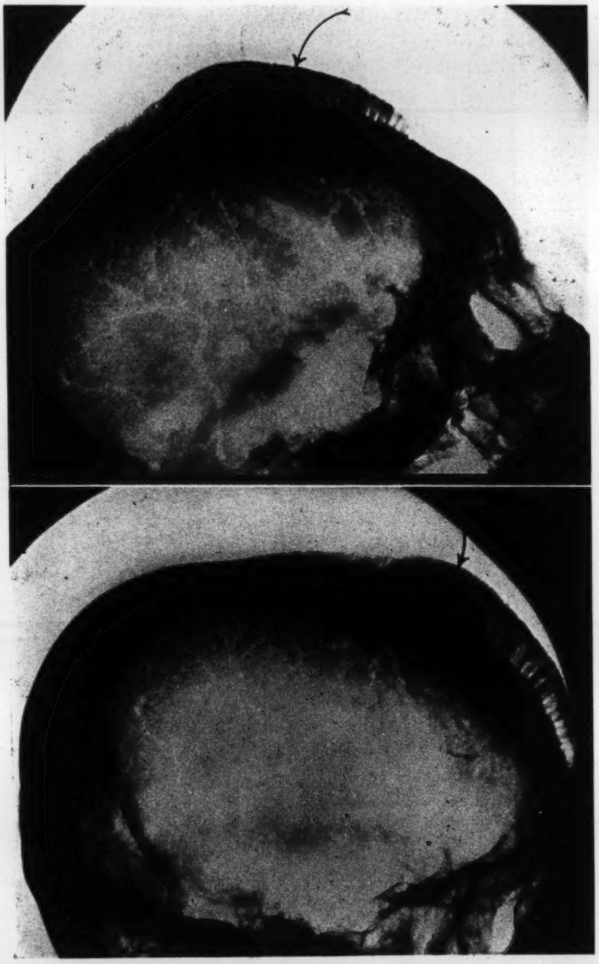

FIG. 8. ROENTGENOLOGICAL APPEARANCE OF THE CRANIAL HYPEROSTOSIS. ROENTGENOGRAMS OF SKULL NO. 158 FROM CHAVINA, PERU, SHOWING THE HAIR-LIKE APPEARANCE OF THE HYPEROSTOSIS AT THE ARROWS. THIS AGREES WITH THE RESULTS OF PHEMISTER (*Arch. Surg.*, VI, 554–572), AND LEADS ONE TO THINK THAT A DIAGNOSIS OF HYPEROSTOSIS CRANII DUE TO A MENINGIOMA FOR THE PREHISTORIC LESION IS CORRECT.

THE TWO FIGURES *a* AND *b* REPRESENT THE APPEARANCE OF THE SKULL, NO. 158 OF THE SAN DIEGO MUSEUM OF ANTHROPOLOGY AT BALBOA PARK, FROM THE RIGHT AT DIFFERENT ANGLES. IN *b* AT THE LOWER LEFT CORNER THERE IS SEEN AN UNUSUAL MASTOID, BUT ITS CONDITION IS PROBABLY NOT CORRELATED WITH THE HYPEROSTOSIS. *a*. RIGHT LATERAL VIEW. *b*. OBLIQUE RIGHT LATERAL VIEW. ROENTGENOGRAMS MADE BY DR. LLOYD C. KINNEY OF SAN DIEGO.

ostoses due to dural meningiomas, it will be best, in view of this uncertainty, to describe their appearance and suggest an intracranial tumor as a possible cause.

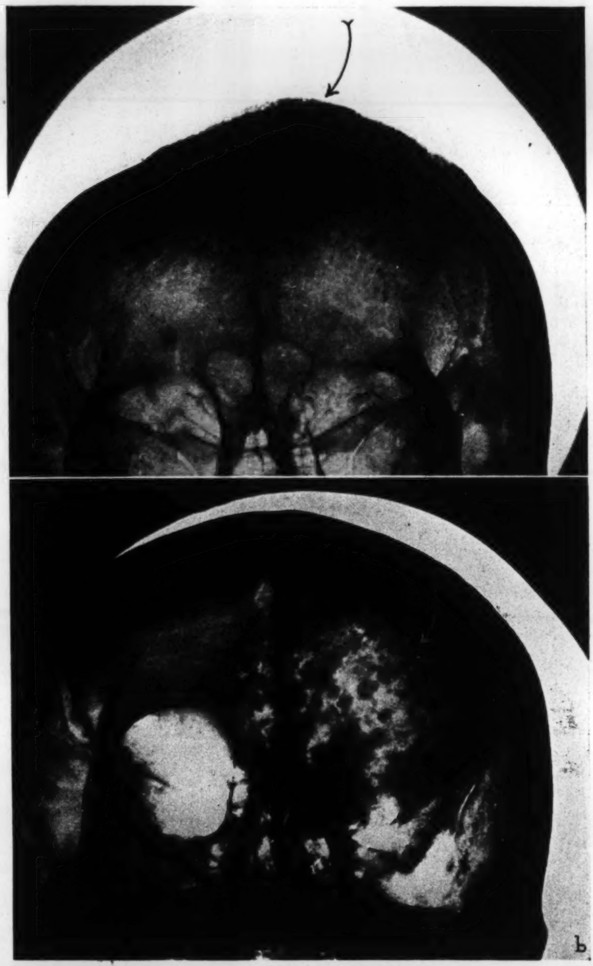

FIG. 9. ROENTGENOLOGICAL APPEARANCE OF PRE-COLUMBIAN TUMORS.

a. A THIRD ROENTGENOGRAM OF THE PREHISTORIC SKULL NO. 158 FROM CHAVINA, SHOWING FACIAL VIEW OF THE HYPEROSTOSIS. THIS PICTURE SHOWS THE LEFT-SIDED LOCATION OF THE TUMOR, AND THE HAIR-LIKE SPICULES (AT THE POINT OF THE ARROW).

b. AT THE POINT OF THE ARROW IS AN ENDOCRANIAL TUMOR WHICH MAY BE A CANCELLOUS OSTEOMA. IT MAY HAVE ARISEN FROM THE ETHMOID. IT HAD IMPINGED GREATLY UPON THE LEFT ORBITAL CAVITY (SEE FIG. 12, *c*) BUT CAN HARDLY HAVE BEEN FATAL. THE SKULL IS NO. 210, SAN DIEGO MUSEUM OF ANTHROPOLOGY AT BALBOA PARK. ROENTGENOGRAMS MADE BY DR. LLOYD C. KINNEY OF SAN DIEGO.

The writings of Cushing[7,12] and Phemister[13] have been of the greatest value in attempting to solve the nature of the new growth on Skull No. 158 and I have used some of their findings in my Figures 1 and 7 and in the text. If properly interpreted the pre-Columbian appearance of the tumor is the earliest known occurrence and has an antiquity of several hundred years. So far as I am aware no instance of the hyperastosis cranii has ever been described among recent vertebrates and certainly none are known among fossil animals, though there is no apparent reason why this type of tumor should be restricted to man.

DESCRIPTION OF PREHISTORIC TUMORS

The ancient tumors will be described here in the order in which they occur in Hrdlicka's catalogue of the San Diego Collection. The condition of the skull other than the tumor will be discussed. The locality and sex are given in the "List."

Skull No. 108 shows a hard eminence with a smooth surface and entirely confined to the outer table. The tumor is scarcely an inch in its greatest diameter.

Skull No. 109 exhibits a depressed area at the bregma with somewhat elevated and thickened margins, presenting an osteoporotic appearance. The porosities are perfectly circular, by varying from 2 mm. to minute diameters and covering an area approximately 65 by 35 mm. The inner skull table is clearly evident since the skull base is broken away. There is no effect whatever of the presence of the lesion, nor is this area any more translucent than the other parts of the parietal. The specimen represents a male well past the prime of life. There are no associated skeletal parts.

Skull No. 110. This ancient female skull shows a pronounced bony tumor (Fig. 12*b* and Fig. 13*b*) with a crater-like depression, to the left of the bregma. The sagittal suture to the right of the tumor meets the right coronal at a right angle. The tumor mass measures 60 mm. The inner skull table is not at all affected. The median nasal septum is deflected to the right and somewhat thinned to the middle of the bone. This is thought to indicate a chronic nasal infection. There is a single left, parietal, foramen, below which at a distance of 15 mm. is an oval, perforating, healed lesion, 10 mm. in length, located exactly on the sagittal suture. The right jugular foramen is much larger than the left. The palate is normal. Third molars not erupted. Teeth all lost but two and these are only slightly worn. The occipital protuberance is prominent; skull otherwise undeformed.

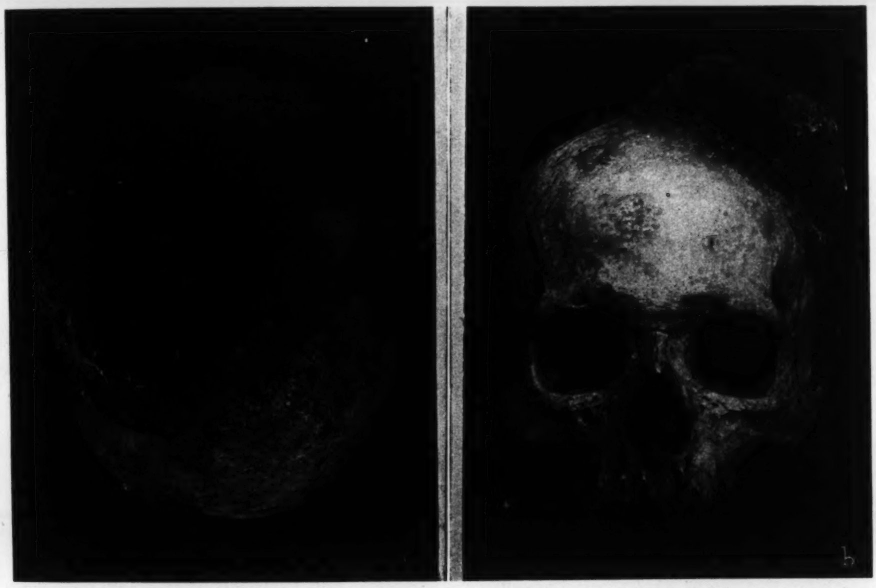

FIG. 10. BONY TUMOR ON THE LEFT FRONTAL AND PARIETAL OF THE SKULL OF AN ADULT, MALE, PRE-COLUMBIAN INDIAN FROM PAUCARCANCHA IN THE HIGHLANDS OF PERU. LARGE BONY EXCRESCENCE DUE TO OSTEOSARCOMA OR BONE CANCER (MACCURDY). IT MAY ALSO BE REGARDED AS A CRANIAL HYPEROSTOSIS. IT RESEMBLES OTHER BONY GROWTHS WHICH ARE DUE TO MENINGIOMAS. IT OCCURS ON THE LEFT SIDE, IS SPONGE-LIKE AND WAS SLOW GROWING. UNFORTUNATELY IT IS NOT POSSIBLE TO SECURE A ROENTGENOGRAM FOR FURTHER COMPARISON.

a. VERTICAL ASPECT SHOWING LARGE CANCELLOUS SPACES WHICH WERE FILLED WITH TUMOR CELLS IF THE HYPERPLASIA WAS DUE TO A MENINGIOMA. BOTH INNER AND OUTER SKULL TABLES WERE DESTROYED NEAR THE CENTRAL PARTS BUT ON THE OUTER MARGINS THE SKULL IS NOT GREATLY AFFECTED.

b. FRONTAL ASPECT GIVING AN IDEA OF THE ELEVATION OF THE NEOPLASTIC BONE WHICH RISES 4.5 CM. THE TOTAL AREA AFFECTED FORMS A SPACE MEASURING 14 CM. BY 11 CM. THE GROWTH OF THIS TUMOR MUST HAVE CONTINUED OVER A PERIOD OF YEARS. PHOTOGRAPHS AND DATA FURNISHED BY PROFESSOR MACCURDY. IT IS DESCRIBED IN HIS PAPER ON THE SKELETAL REMAINS FROM THE HIGHLANDS OF PERU.

Skull No. 111 is shown in Figure 12*a*, a skull undeformed with a prominent occipital bulge. Dental disturbances are indicated in the loss of both second molars through alveolar abscesses, resulting in a thickening of the alveolar margin. There is an indication of a slight nasal infection. The skull is otherwise normal, well preserved, the bones being unusually hard and firm. The tumor is ivory-like in its dense smoothness. The neoplasms in Skulls 108 and 111 are very similar in external appearance.

Skull No. 157. This female skull is shown in Figures 4, 5 and 6. An eroded area, 50 mm. in diameter, is present on the right frontal. This may have been an area of pressure erosion due to a tumor in the scalp but this would not explain the porosities. The inner skull table is not at all affected. The area may also have been due to the presence of an endocranial, meningeal tumor caused by the outgrowth of tumor cells. The left maxilla is almost totally destroyed by what seems to have been a huge alveolar abscess, measuring 45 mm. in length. Hrdlicka, in his catalogue, suggested that the lesion was due to a large, soft tumor. The erosion is so extensive that the maxillary sinus is exposed through a large opening, as is also the nasal chamber.

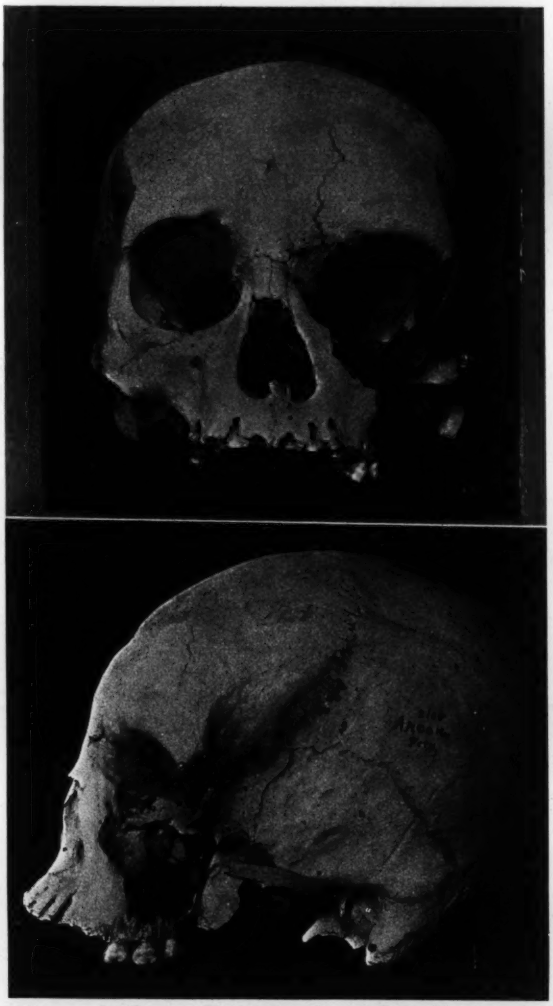

Fig. 11. An Orbital Tumor in a Female Skull No. 210, from Ancon, Peru. Preserved at Balboa Park, Museum of Anthropology, San Diego, California.

a. Facial View of Skull Showing Tumor in the Median Wall of the Left Orbit. The Long, Irregular Crack Extending Upward on to the Frontal Is Not a Fracture but a Crack Due to Its Exposure to the Weather. The Presence of the Tumor Has Changed the Consistency of the Bone. This Effect Is Shown and May Be Seen, on Careful Examination, over the Greater Part of the Left Frontal Bone, Extending Well beyond the Median Line.

b. Left Lateral View of Skull. The Left Malar Arch, the Left Orbital Wall and the Left Wall of the Maxillary Sinus Are Broken Away, Post Mortem, and Permit a Clear View of the Tumor in the Median Orbital Wall. The Tumor Is Thought to be a Cancellous Osteoma. The Outer Table Has Partly Flaked Off on the Posterior Part of the Frontal. This Is Due to Exposure to the Weather after It Had Been Heedlessly Thrown from the Grave by Treasure Hunters.

The bony palate is eroded as far back as the alveolus of the second molar. There is no apparent association between the two lesions, although the frontal area may have been due to a metastasis from the palate. The skull is otherwise undeformed and perfect.

Skull No. 158. (See Fig. 2, 3, 8, and 9.) This is the most remarkable tumor preserved in the San Diego Collection. It is the best preserved tumor of this type known from the prehistoric cemeteries of coastal Peru. Another example apparently due to the same cause was described by MacCurdy from the highlands of Peru and is here shown in Figure 10.

The Skull No. 158 is apparently that of a female, and is small. It is well preserved though the anterior portions of the tumor mass have been broken away. It had apparently lain for some years in the sun, for it is bleached white. The bones are hard, smooth and firm. It lay with the right side exposed. The tumor mass (hyperostosis cranii) lies slightly to the left of the median line and extends over the entire frontal bones and anterior parts of both parietals, covering an area 130 mm. by 150 mm. with a maximum thickness of 20 mm. The hyperostosis is seen to decrease in thickness from near the center of the left frontal outward. On the right frontal, where part of the tumor growth is broken away, it seems that the neoplastic bone, especially around the edges, was scale-like and only slightly adherent to the outer skull table. With the aid of a flashlight the endocranial vault was seen to be somewhat disturbed immediately below the external tumor. There is a roughened osteophytic, sponge-like area with an appearance similar to the external hyperostosis, but quite low. Had the individual lived longer the entire skull in this area might have been totally destroyed, as it was in the case of the hyperostosis described by MacCurdy from the highlands of Peru. There is a single, right parietal foramen. The skull shows a very marked unintentional deformation probably because of binding on a cradle board, on which the child lay habitually on the left side of the occiput, producing a large bulge in the right parietal eminence. The sutures are all distinct, indicating that the individual was not old. The condition of the teeth, however, is such that an accurate estimate of the age cannot be made, since only one molar remains. The molars and bicuspids of the two sides were lost by disease producing an alveolar osteitis, such as is found following pyorrhea. The last bicuspid of the right side was lost because of an alveolar abscess, which had penetrated by means of a circular opening into the maxillary sinus. At the same time it destroyed all of the alveolar walls in this region. On the left side the first molar was lost by an alveolar abscess which is still

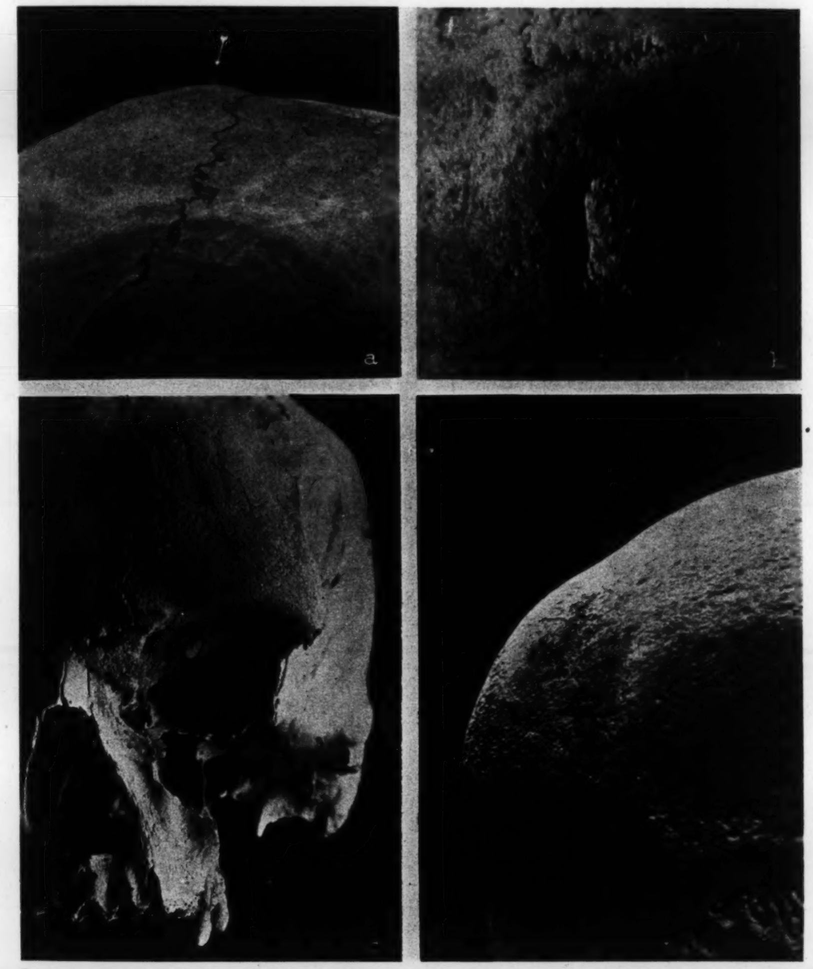

FIG. 12. PRE-COLUMBIAN CRANIAL TUMORS PRESERVED IN THE MUSEUM OF ANTHROPOLOGY AT BALBOA PARK, SAN DIEGO.

a. PREHISTORIC SKULL, NO. 111, FROM SAN DAMIAN, PERU. MALE. BONY TUMOR IN FRONT OF BREGMA. THE ROENTGENOGRAM DOES NOT REVEAL ANY STRUCTURAL CHANGES. THE TUMOR HAS AN IVORY-LIKE CONSISTENCY AND THE ENTIRE VAULT IS UNUSUALLY DENSE BONE.

b. PREHISTORIC SKULL, NO. 110, FROM CINCO CERROS, PERU. FEMALE. BONY TUMOR IN FRONT OF BREGMA. ROENTGENOLOGICAL APPEARANCE SHOWN IN FIGURE 13*b*.

c. PREHISTORIC SKULL, NO. 210, FROM ANCON, PERU. FEMALE. "MARKED ENLARGEMENT, INVOLVING THE WHOLE LOWER PORTION OF THE FRONTAL ON THE LEFT SIDE, POSSIBLY DUE TO A CYST OR OTHER PATHOLOGICAL CONDITION IN THE LEFT SUPRA-ORBITAL SINUSES" (HRDLICKA). THE ROENTGEN-RAY REVEALS IT AS A CANCELLOUS OSTEOMA (SEE FIGURE 9*b*). THE SKULL IS OTHERWISE ONLY SLIGHTLY CHANGED. IT IS UNDEFORMED.

d. PREHISTORIC SKULL, NO. 179, FROM CHICAMA, PERU. MALE. BONY TUMOR ON THE LEFT PARIETAL EMINENCE. THE ROENTGENOLOGICAL APPEARANCE IS SHOWN IN FIGURE 13*a*.

evident as a pit 13 mm. in diameter, on one side of which there is a slight perforation into the maxillary sinus.

As may be seen in the lateral view (Fig. 2) the forehead slopes distinctly backwards in line with the face, doubtless indicating flat facial features in life.

Some nasal infection had produced great changes in the anatomy of the nose. The median nasal septum was almost completely destroyed during life. Only a slight very thin part remains in the posterior part of the nasal chamber. Judging from the broken base of the septum on the floor of the nasal chamber there had been marked deflection to the left before the destruction of the body of the bone. The thinning and destruction of the median nasal septum can best be seen by examination from below. The right lacrimal bone is completely riddled by the infection which had invaded the right nasolacrimal duct. The inferior conchae are greatly enlarged and prolonged downwards.

The hyperostosis in Skull 158 covers the bregma. Five other skulls which have been selected for study show the tumor adjacent to the bregma. Three of these are on the right and two on the left of the median line of the skull.

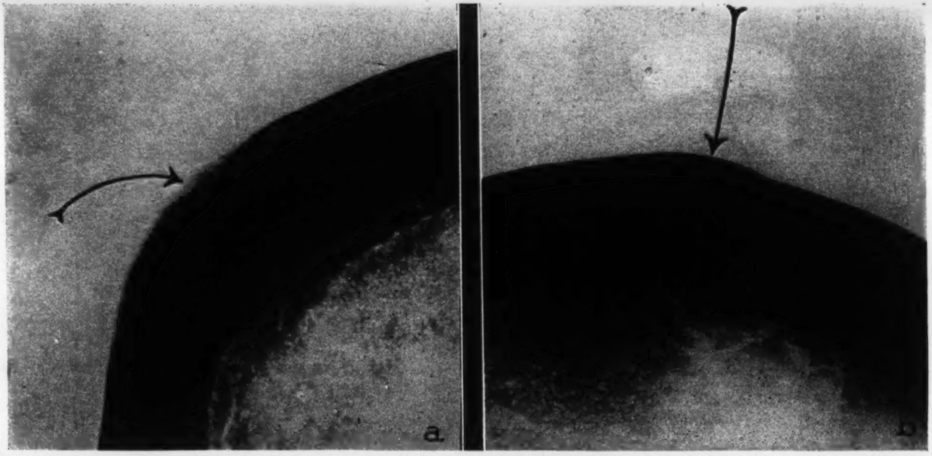

Fig. 13. Pre-Columbian Cranial Tumors from Peru.
a. Roentgenogram of Tumor on Skull No. 179. See Figure 12, *d.*
b. Roentgenogram of Tumor on Skull No. 110. See Figure 12, *b.*

These tumors all differ from the condition known as osteoporosis in being asymmetrical and always single. The osteoporotic condition is always paired and is always bilaterally symmetrical.

There is no reason to assume that the etiology of the hyperostosis cranii in the prehistoric Peruvian Skull No. 158 is any different from modern examples of this hypertrophy. They appear to be the same yet we must reserve final judgment to a time when further examples are made known, both modern and ancient. We are totally in the dark as to the cause of the meningioma which produces the hyperostosis cranii. It has been said to be a response to a sharp penetrating injury, but such injuries are commonly seen in pre-Columbian Peruvian skulls and one wonders why there are no more examples of this hypertrophy if such is the case. Skulls showing hyperostoses are extremely rare, possibly one in five thousand. None of these lesions shows evidences of bacterial infection. The skulls showing tumors are derived from different localities along or within 150 miles of the coast: Chicama, Huacho, Chavina, Nasca, Ancon, Cinco Cerros and San Damian. (See map.)

The growth is a neoplasm of a benign

type. There is nothing to indicate that the increase in size of either the meningioma or the hyperostosis was painful and only a menace to life when the endocranial tumor became so large as to produce pressure symptoms. The neoplasms are not restricted to the members of one sex, since there are three female and five males which show some stage in the growth of the tumor, provided the skulls studied show the same type of tumor. But this is uncertain. All skulls are adult and no adolescent material presents evidences of this type of lesion. In fact one skull, No. 108, which shows the earliest stage of growth, or at least the smallest tumor, is that of an individual past the prime of life. There are no accompanying dental or arthritic changes which can be said to be associated with these hyperplasias. We are unable to determine the skeletal changes since only the skull is known. Not even the mandible was found with the cranium.

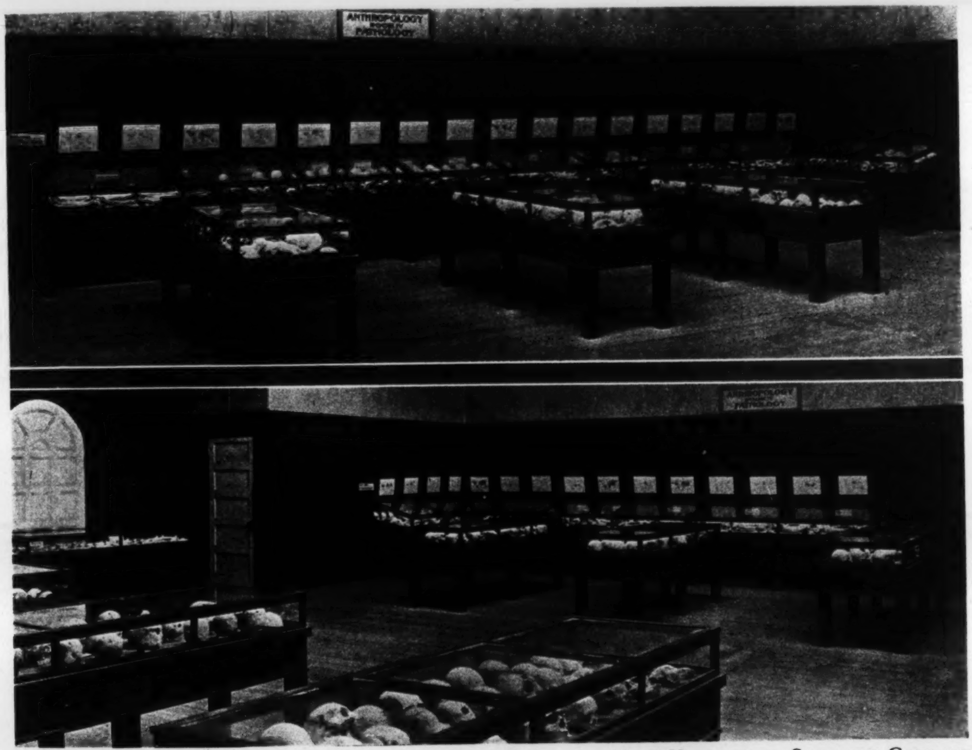

FIG. 14. THE PRE-COLUMBIAN PATHOLOGY OF PERU IS SHOWN IN THE MANY HUNDREDS OF SPECIMENS CONTAINED IN THE CASES OF ROOM IV, SAN DIEGO MUSEUM. THESE PHOTOGRAPHS SHOW THE QUANTITY AND QUALITY OF THE MATERIAL FOR THE STUDY OF "THE PALEOPATHOLOGY OF PERU" AS THE SPECIMENS WERE ARRANGED IN THE WOODEN BUILDING FOR THE PANAMA-CALIFORNIA EXPOSITION IN 1915. EARLY IN 1925 THE COLLECTION WAS MOVED TO A FIREPROOF BUILDING ACROSS THE STREET. THESE PICTURES THUS HAVE AN HISTORICAL VALUE IN REGARD TO THE COLLECTION.

Above. THE COLLECTION OF PREHISTORIC PERUVIAN INDIAN SKELETONS FROM THE COASTAL PLAINS. THE SKULLS IN THESE CASES SHOW TRAUMATA OTHER THAN SURGICAL. THE LIMB BONES IN THE LAST SECTION OF THE WALL CASE TO THE EXTREME LEFT ARE ESKIMO FROM THE ST. LAWRENCE ISLAND IN BERING SEA. THE MAPS ON THE WALL SHOW THE DISTRIBUTION OF CERTAIN TYPES OF DISEASE.

Below. THE OTHER SIDE OF THE ROOM CONTAINS, IN THE THREE TABLE CASES, EXAMPLES OF ALL TYPES OF TREPHINING. THE TREPHINED CRANIA HITHERTO DESCRIBED HAVE BEEN LARGELY OBTAINED FROM THE PERUVIAN HIGHLANDS. THESE SKULLS SHOWN HERE ARE FROM THE MOUNTAINS NEAR THE COAST. SINCE THIS COLLECTION IS A UNIQUE ASSEMBLAGE OF PALEOPATHOLOGICAL MATERIAL THESE PICTURES WILL BE INTERESTING TO HAVE PRINTED WITH THE DISCUSSION OF CRANIAL TUMORS WHICH ARE FROM AMONG THE SPECIMENS SHOWN.

An adult male described by MacCurdy[14] from Paucarcancha, Peru, reveals a lesion, shown in Figure 10, which is apparently an hyperostosis cranii due to the outgrowth of tumor cells from an underlying meningioma.

MacCurdy says of this skull:

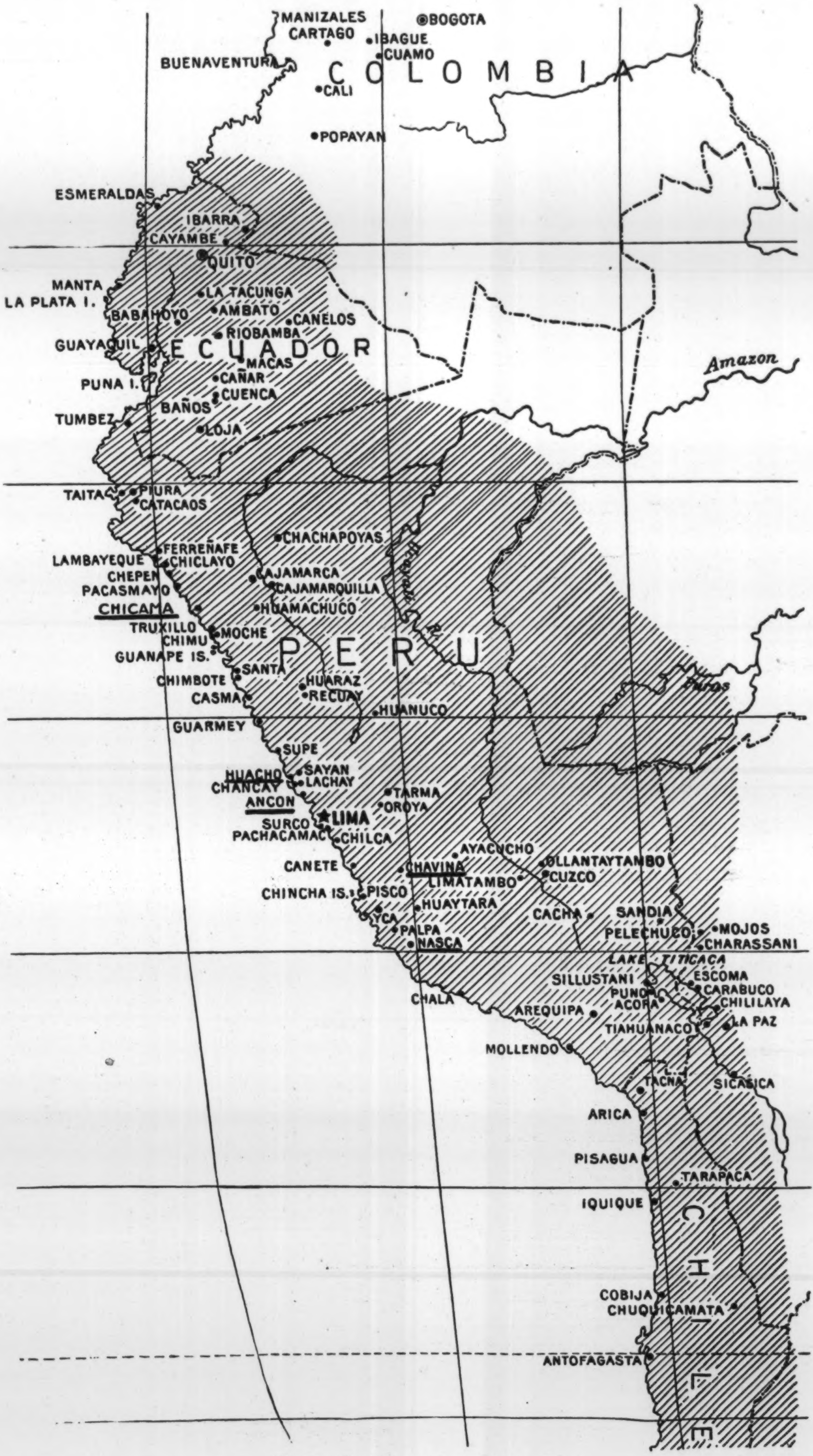

FIG. 15. SEE CAPTION ON PAGE 411.

A picturesque and at the same time gruesome example is to be seen in an adult male some sixty years old from Paucarcancha. Osteosarcoma, a variety of bone cancer, had produced an enormous bony excrescence reaching from the left frontal eminence to the left parietal, and encroaching for some distance on the right parietal (Pl. xxxix). The height of this osteophytic excrescence is about 4.5 cm. Underneath all of its outer margin, the walls of the cranium are entirely gone. The bone outside the boundaries of the cancerous growth is changed for a considerable distance, so that the total area affected forms an oval measuring about 14 by 11 cm. The growth of this excrescence must have continued through a period of years.

Skull No. 179. Very large, brachycephalic, and lop-sided. An unintentional deformity, due to the pressure of a cradle board on the left occiput, is evident in a bulge on the right side. The occipital breadth is exaggerated by the presence of the tumor mass on the left parietal. The inner skull table is not at all affected. The teeth are all present, including third molars, perfect and unworn. Pterygoid bones greatly enlarged but not diseased. The age was about forty; cause of death unknown. There are no indications of a nasal infection. There are low osteophytes along the line of attachment of the temporal muscle. The tumor is low and broad, with a knob-like appearance. The roentgenogram (Fig. 13*a*) shows changes in the arrangement of the trabeculae. The cause and nature of this tumor are unknown. There is no indication of traumatism.

Skull No. 210. A large well-preserved female skull. There is a large tumor mass in the median side of the roof of the left orbit. The appearance of the roentgenogram indicates a cancellous osteoma which may have arisen from the median line of the endocranium. The growth has intruded into the upper median angle of the orbit, doubtless producing certain ocular changes by pressure on the orbital contents. The skull is otherwise undeformed. The median nasal septum is deflected to the right. Absorption and hypertrophy of the upper alveolar margins indicate a diseased condition in the first molars and last bicuspids. The third molars are not erupted. The palate is otherwise normal. The condition of the inner skull table cannot be ascertained. A circular, depressed and healed injury occurs on the occipital near the foramen magnum. (Figs. 9*b*; 11, *a* and *b*; and 12*c*.)

ACCIDENTAL RESEMBLANCES

Dean[15] has discussed several examples of adaptive conformity, protective mimicry, and protective coloration among animals; examples of which have caused many naturalists to become unduly saturated with the belief that animals and plants adapt themselves to their surroundings. Many of the examples cited lead one to believe that most such resemblances are meaningless, such as the features of a Scandinavian fisherman depicted on an isolated ear bone of a whale by the erosive effects of the waves. To this category I would assign the marked resemblance between the surface features of the hyperostosis cranii described above on Skull No. 158 and certain commercial sponges (see Fig. 3). The resemblance is striking even down to major details. Such a correspondence between organic forms as far apart as the sponges and man can have no known significance.

RÉSUMÉ

Prehistoric Peruvians were not exempt from tumors although the incidence of such

FIG. 15. ARCHEOLOGICAL MAP OF THE WEST COAST OF SOUTH AMERICA COMPILED WITH REFERENCE TO THE COLLECTIONS IN THE AMERICAN MUSEUM OF NATURAL HISTORY BY CHARLES W. MEAD AND HERE MODIFIED TO SHOW, BY THE SHADED PORTION, THE GREATER PART OF THE ANCIENT EMPIRE OF THE INCAS. THE AREA EXTENDS IN A GRADUALLY NARROWING COASTAL MARGIN SOME HUNDREDS OF MILES FURTHER SOUTH THAN THE MAP SHOWS. THE OCCUPIED TERRITORY HAD AN EXTENT OF 2200 MILES OF COASTLINE, THE GREATER PART OF WHICH IS NOW DESERT. THE LOCALITIES, UNDERSCORED ON THE MAP, INDICATE THE PLACES WHERE THE MATERIAL DESCRIBED IN THIS PAPER WAS SECURED BY ALES HRDLICKA. TWO OF THEM ARE SOUTH OF THE CAPITOL OF PERU, LIMA, AND THREE ARE NORTH. THE MAP DOES NOT INDICATE THE RUGGED TOPOGRAPHY OF THE ANCIENT INCAN EMPIRE, WITHIN WHICH THERE ARE SAID TO BE FIFTY MOUNTAIN PEAKS OVER 18,000 FEET ABOVE THE SEA, ONE OF WHICH TOWERS OVER 23,000 FEET. THE BASE OF THE MOUNTAINS IS ON THE AVERAGE FORTY MILES FROM THE COAST AND ON THIS NARROW BELT RAIN SELDOM FALLS.

neoplasms, on the basis of known collections and descriptions, is very low. The most interesting types of bone changes, due to tumor-growth, are those known as the hyperostosis cranii, an excess production of bone due to the presence of underlying endocranial dural meningiomas. Careful comparison of modern descriptions and examples with the Peruvian material lead to the satisfactory conclusion that the ancient tumors have the same characteristics as the modern ones and can be discussed by the same terms.

A large tumor invading the left orbit appears to be a cancellous osteoma. It was probably of endocranial origin.

Other neoplasms seem to belong to differing types.

The age of the material described is undoubtedly pre-Columbian, since there were no evidences of Spanish occupation in the articles obtained from the graves. They may be a few hundred or a few thousand years old. There is no known way to date this material since it was largely picked up from the surface where the skeletons had been thrown by treasure hunters who had despoiled the cemeteries in which the bones had lain for uncounted centuries.

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STUDIES IN PALEOPATHOLOGY XIX

PLEISTOCENE EXAMPLES OF TRAUMATIC OSTEOMYELITIS

By ROY L. MOODIE, PH.D.

CHICAGO, ILLINOIS

IT is my intention to describe, in this series of essays, typical lesions among fossil animals and in prehistoric man, so that, in future, reference may be made to these descriptions, thus avoiding the need of increasing the number of papers containing additional discussions of similar lesions. There are several Pleistocene mammals showing, in the limb bones, the effects of deep-seated medullary infections. Such lesions are seen in the humerus and tibia of the giant wolf (*Aenocyon dirus*) and in the humerus of a large lion (*Felis atrox bebbi*) from the Rancho la Brea beds of southern California.[1] These infections are all thought to have followed compound fractures of the bones. They show the healed conditions of traumatic osteomyelitis.

Humerus of a Lion

The lion's humerus is that of an unusually large individual. The proximal epiphysis is wanting, thus suggesting a young animal. The bone is, however, larger than any of a dozen or so humeri of apparently adult lions of the same sub-species preserved in the Museum. Some individuals of *Felis atrox bebbi* are larger than the African lion.[2] The skull of one individual in the Los Angeles Museum has a length of eighteen inches. The sub-species is confined to southern California but the species *Felis atrox* has a much wider distribution.[3]

The fractured humerus of the lion (Fig. 1), lacking the proximal epiphysis, has a bicondylar length of 410 mm., while a complete, normal, adult bone of another individual measures 350 mm. in length. The breadth of the pathological bone between the condyles is 142 mm. Its greatest circumference around the callus is 274 mm. The length between the epiphyseal lines is 370 mm.

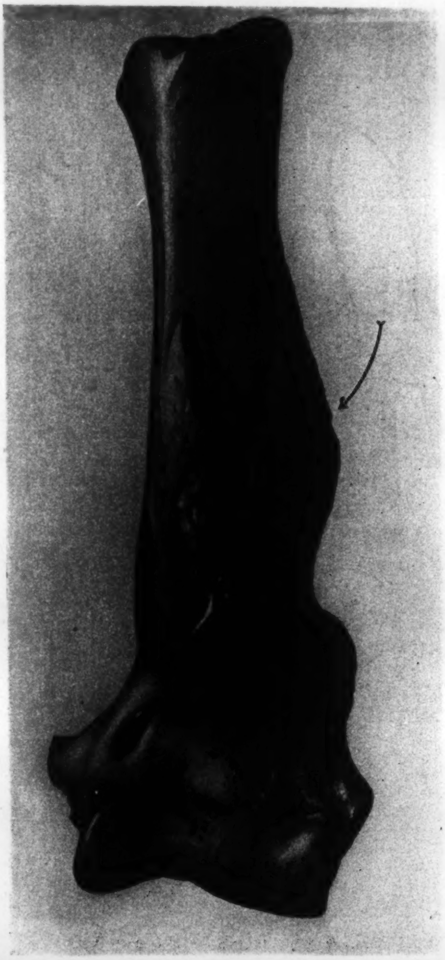

Fig. 1. Anterior Aspect of a Left Humerus of a Pleistocene Lion, *Felis atrox bebbi*, from the Asphalt Pits of the Rancho la Brea on Wilshire Boulevard, Los Angeles, California. The Long Dark Depression, on the Right of the Picture, at the Arrow, Is Undoubtedly a Necrotic Sinus for the Discharge of Pus from the Medullary Infection. A Similar, Though Smaller, Sinus Is to Be Found on the Back of the Humerus. The Roughened Surfaces Adjoining the Sinuses, Which Usually Indicate the Persistence of an Infection, Are Wanting in This Case. The Pitted Anterior Surface Is Smooth, the Edges of the Pits Well Rounded. We May Thus Conclude That the Infection in the Medulla of the Humerus Had Almost Completely Healed. The Oval Opening Just above the Condyle on the Left of the Figure Is the Entepicondylar Foramen, a Normal Structure. The Specimen Is Preserved in the Museum of History, Science and Art, at Exposition Park, in Los Angeles.

ERRATUM

of bone due to the presence of underlying endocranial dural meningiomas. Careful comparison of modern descriptions and examples with the Peruvian material lead to the satisfactory conclusion that the ancient tumors have the same characteristics as the modern ones and can be discussed by the same terms.

A large tumor invading the left orbit appears to be a cancellous osteoma. It was probably of endocranial origin.

Other neoplasms seem to belong to differing types.

The age of the material described is undoubtedly pre-Columbian, since there were no evidences of Spanish occupation in the articles obtained from the graves. They may be a few hundred or a few thousand years old. There is no known way to date this material since it was largely picked up from the surface where the skeletons had been thrown by treasure hunters who had despoiled the cemeteries in which the bones had lain for uncounted centuries.

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It is my intention to describe, in this series of essays, typical lesions among fossil animals and in prehistoric man, so that, in future, reference may be made to these descriptions, thus avoiding the need of increasing the number of papers containing additional discussions of similar lesions. There are several Pleistocene mammals showing, in the limb bones, the effects of deep-seated medullary infections. Such lesions are seen in the humerus and tibia of the giant wolf (*Aenocyon dirus*) and in the humerus of a large lion (*Felis atrox bebbi*) from the Rancho la Brea beds of southern California.[1] These infections are all thought to have followed compound fractures of the bones. They show the healed conditions of traumatic osteomyelitis.

HUMERUS OF A LION

The lion's humerus is that of an unusually large individual. The proximal epiphysis is wanting, thus suggesting a young animal. The bone is, however, larger than any of a dozen or so humeri of apparently adult lions of the same sub-species preserved in the Museum. Some individuals of *Felis atrox bebbi* are larger than the African lion.[2] The skull of one individual in the Los Angeles Museum has a length of eighteen inches. The sub-species is confined to southern California but the species *Felis atrox* has a much wider distribution.[3]

The fractured humerus of the lion (Fig. 1), lacking the proximal epiphysis, has a
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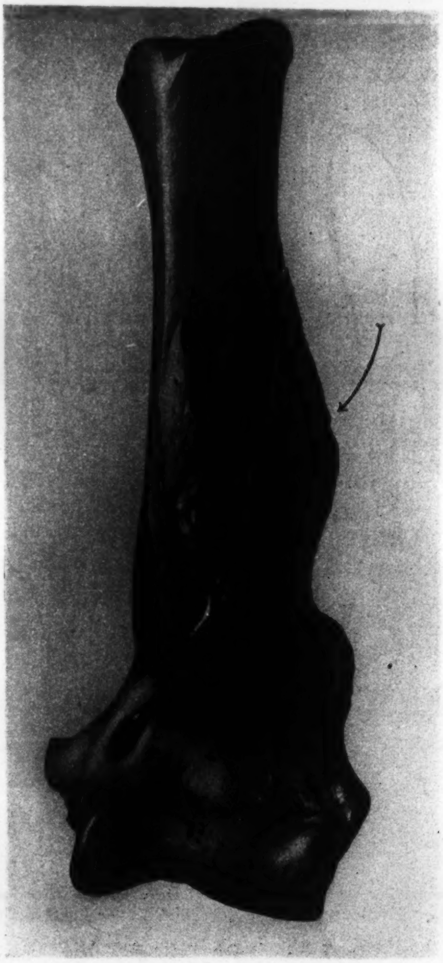

FIG. 1. ANTERIOR ASPECT OF A LEFT HUMERUS OF A PLEISTOCENE LION, *Felis atrox bebbi*, FROM THE ASPHALT PITS OF THE RANCHO LA BREA ON WILSHIRE BOULEVARD, LOS ANGELES, CALIFORNIA. THE LONG DARK DEPRESSION, ON THE RIGHT OF THE PICTURE, AT THE ARROW, IS UNDOUBTEDLY A

ERRATUM

Although the specimen shown in Figure 1 has been on exhibit in the Museum for years as a lion, and was so regarded by many individuals, yet it seems more probable that this incomplete and much distorted bone is the humerus of a young bear. R. L. M.

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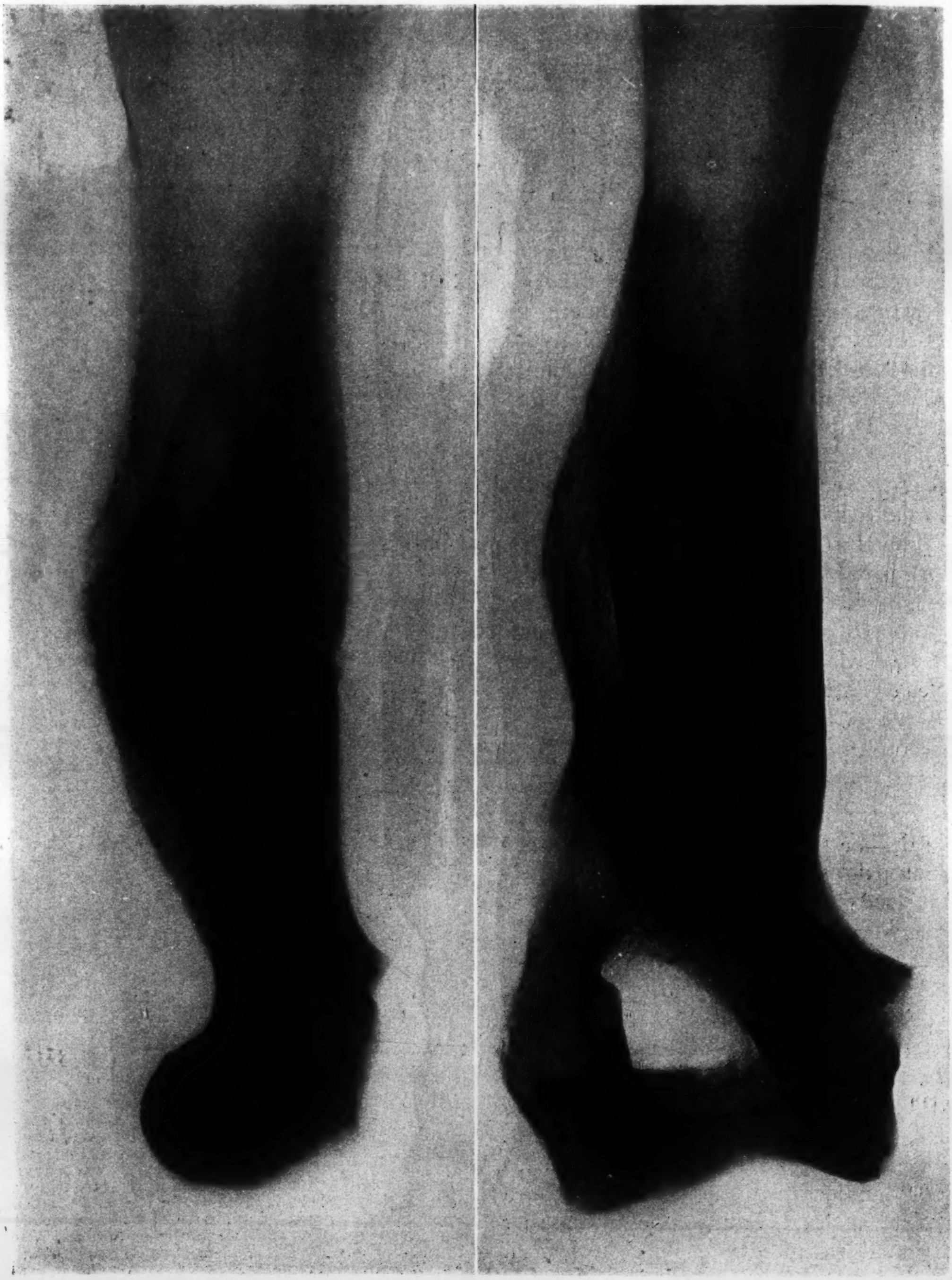

Fig. 2. *Left.* Roentgenogram Showing Lateral Aspect of Fractured Humerus of Lion, *Felis atrox bebbi,* from the Rancho la Brea. The Healed Condition of the Fracture, as well as the Succeeding Osteomyelitis, Is Evident from the Condition of the Trabeculae. The Offset and Viscious Union of the Ends Are Explained in the Diagram, Figure 3.

Right. Posterior Aspect of Humerus Showing How the Peripheral Portion of the Diaphysis Had Been Splintered Off and the Upper Portion Had Been Shoved Down, Thus Shortening the Bone. The Black Area near the Middle of the Bone Doubtless Represents a Portion of the Medullary Cavity Filled with Asphalt. It May Be an Erosion Cavity. The Fractured Ends Are Quite Evident. The Overlap of the Parts of the Shaft Occurs in the Lower One-third of the Specimen. It Is Obscured Externally by Callus. Roentgen Rays by Dr. Henry Snure.

The bone is massive in its proportions[4] and from the anterior aspects shows a healed oblique fracture, with a large amount of callus which is cut on its surface by channels, shown in Figure 1. These channels indicate the margins of the fractured and splintered bone where the upper end of the limb bone had been shoved down into the lower part as into a sleeve, with three long projecting ends. Doubtless the depression to the left of the sinus, which is indicated by an arrow, represents another sinus filled with secondary bone. The large sinus to the right has a depth of 17 mm.; the opening is more than 50 mm. long, by 20 mm. in greatest breadth. The opening of the sinus on the back of the humerus has a length of 15 mm.

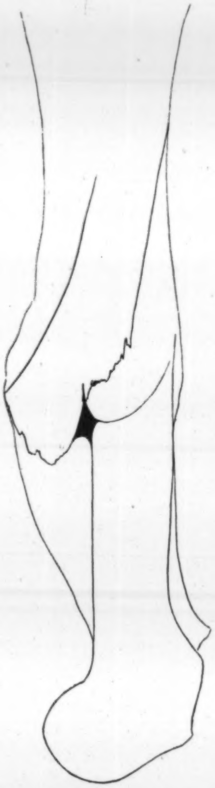

FIG. 3. DIAGRAMMATIC SKETCH OF THE ROENTGENOGRAM OF THE LATERAL ASPECT OF THE LION'S HUMERUS. THIS SHOWS THE OFFSET OF THE FRACTURED ENDS.

The external appearances of the bone show a well-healed condition of both the fracture and the infection. This is substantiated by the roentgenograms (Fig. 2) and by the diagram of the osseous trabeculae (Fig. 4). These show there is still a medullary cavity, which may have been due to erosion of the bone by the infection or which may be a portion of the original medulla. The roentgenograms of the fractured humerus (Fig. 2) show clearly the nature of the fracture, its offset, healing with callus, union, marked rotation of the

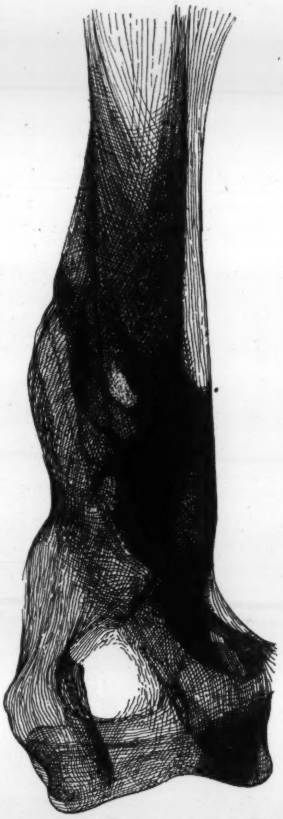

FIG. 4. DIAGRAMMATIC SKETCH OF THE ROENTGENOGRAM SHOWN ON THE RIGHT OF FIGURE 2, INDICATING THE DIRECTION AND NATURE OF THE TRABECULAE IN THE HEALED BONE. THERE STILL REMAINS A MEDULLARY CAVITY BUT IT IS DOUBTFUL IF THE INFECTION WAS ACTIVE IN THIS CAVITY. THE SMOOTHNESS OF THE AREA AROUND THE SINUS OPENING INDICATES THAT THE DISCHARGE OF PUS HAD CEASED. THE NATURE OF THE FRACTURE IS INDICATED BY THIS SKETCH TO HAVE BEEN ONE OF THE GREEN-STICK VARIETY WHERE THE UPPER SEGMENT OF THE DIAPHYSIS IS SHOWN TO HAVE BEEN SHOVED DOWN INTO THE LOWER END LIKE A LARGE PEG. THE UPPER END IS HELD TIGHTLY IN PLACE BY FOUR LONG BONY SPLINTS WHICH WERE LOOSENED AT THE TIME OF THE ACCIDENT. THE MISPLACED FRACTURED ENDS ARE QUITE EVIDENT. ONE IS JUST ABOVE THE BLACK AREA, AND THE OTHER TO THE LEFT WHERE IT IS SHOVED BY FOR SEVERAL CENTIMETERS.

lower end and slight angulation of the shaft. It is a matter of regret that the head of the bone is lost since it prevents any attempt at measuring the degree of torsion due to the fracture, which might have been done with a parallelograph. The angulation is evident in Figure 4.

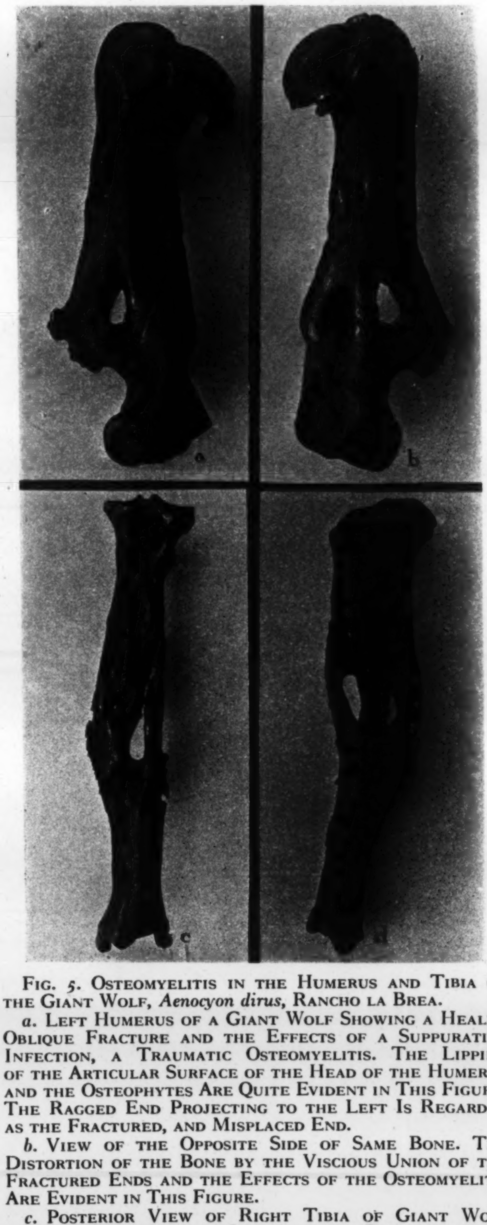

Fig. 5. Osteomyelitis in the Humerus and Tibia of the Giant Wolf, *Aenocyon dirus*, Rancho la Brea.

a. Left Humerus of a Giant Wolf Showing a Healed Oblique Fracture and the Effects of a Suppurative Infection, a Traumatic Osteomyelitis. The Lipping of the Articular Surface of the Head of the Humerus and the Osteophytes Are Quite Evident in This Figure. The Ragged End Projecting to the Left Is Regarded as the Fractured, and Misplaced End.

b. View of the Opposite Side of Same Bone. The Distortion of the Bone by the Viscious Union of the Fractured Ends and the Effects of the Osteomyelitis Are Evident in This Figure.

c. Posterior View of Right Tibia of Giant Wolf Showing Effects of an Osteomyelitis, Represented by Large Opening and Abundant Sharp-pointed Osteophytes. A Portion of the Shaft of the Fibula Is Coossified with the Tibia but a Part of the Bone Was Necrosed by the Infection.

d. Oblique View of Right Tibia Showing the Three Large Sinus Openings, One of Which Has a Diameter of 40 Mm. and the Slender Bridges of Bone Which Have Replaced the Diaphysis.

Humerus of a Wolf

The left humerus of an adult giant wolf (*Aenocyon dirus*) preserved in the Los Angeles Museum, shows unusual effects of an osteomyelitis (Fig. 5, *a* and *b*) which had completely healed. The bone is considerably shortened by the compound oblique fracture which is still evident. The pathological humerus measures 190 mm. in length, while a normal series of two hundred wolf humeri shows measurements from tip of deltoid eminence to tip of internal condyle of 190 mm. to 235 mm., with an average of 217 mm. The fractured ends had become misplaced and had healed following a violent infection. The latter had developed into an osteomyelitis from which there were four sinuses about 20 mm. in diameter, opening on to the surface of the bone. The osteomyelitis had healed completely, since all of the surfaces of the bridges of bone and the accompanying osteophytes are smooth. If there was a sequestrum it has been lost.

The head of the humerus is greatly deformed by the shortening, due to the manner of healing of the fracture, as well as by an arthritic inflammation. There is an eburnated area, 50 mm. in diameter, around which osteophytic growth is abundant. Further discussion of this matter will be postponed for consideration in a special essay, with the title, "Pathological Changes in the Articular Surfaces of the Limb Bones of Pleistocene Mammals." The roentgenogram (Fig. 6*a*) shows the nature of the trabeculae.

Radiographic examination of fossil bones does not always yield satisfactory results because of the changes wrought in the bones by the matrix in which the specimens are preserved. Infiltration of asphaltum-impregnated soil into the wolf humerus (Fig. 6*a*), as well as considerable hypertrophy of the bone itself following the injury, is responsible for the denseness of the upper part of the shaft. The picture does show, however, the trabecular architecture of the osseous bridges which have taken on the functions of the diaphysis. Here it is seen that these bridges are formed of periosteal bone.

The radiographic appearance of the tibia (Fig. 6*b*) is likewise peculiar, due in part to the thinness of the bone, as well as to imperfect infiltration. The original injury was doubless a crushing bite and the results are more widespread than in a fracture.

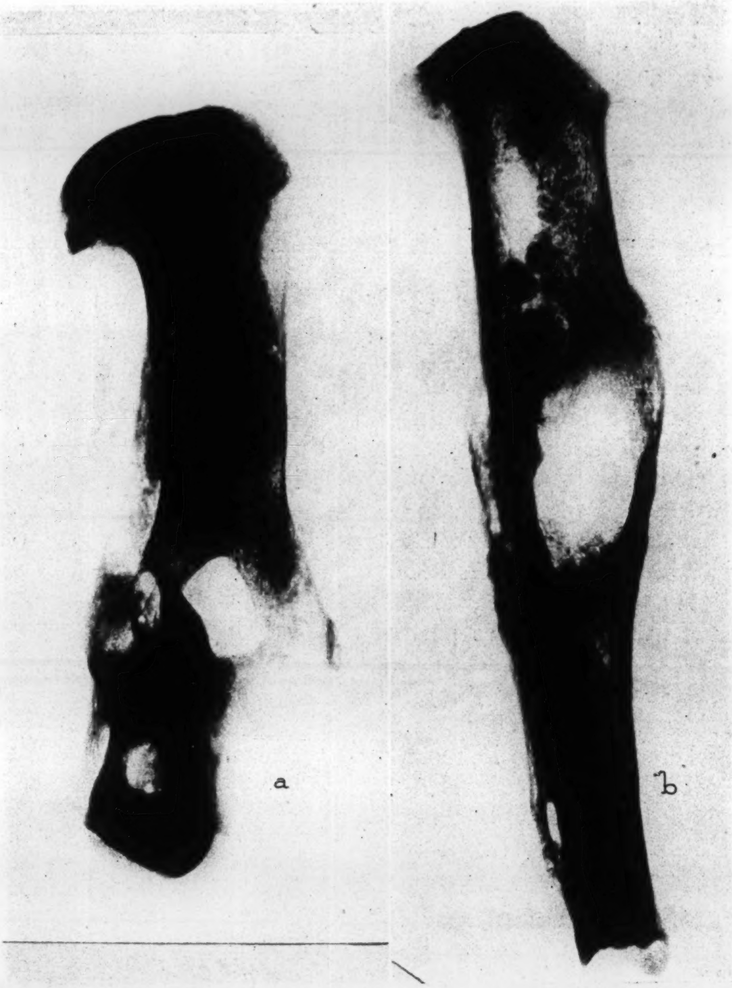

Fig. 6. *a.* Roentgenogram of Left Humerus of Giant Wolf (*Aenocyon dirus*) Showing Effects of the Osteomyelitis, Following Compound Fracture, on the Architecture of the Bone. The Continuity of the Diaphysis Is Totally Destroyed and Is Replaced by Three Bridges of Periosteal Bone Which Are Continuations of the Perichondrial Part of the Shaft.

b. Roentgenogram of Right Tibia and Fibula of a Giant Wolf. The Irregular Appearances in This Bone Are Probably Due to an Incomplete and Irregular Infiltration of the Bone with Asphalt. See Figure 5, *c* and *d*. Roentgen Rays by Dr. Henry Snure.

Tibia of a Wolf

The effects of the osteomyelitis in the right tibia of the dire wolf (Fig. 5*c*, *d*) are even more striking than in the humerus just described. The shaft of the bone is entirely gone and the two ends are supported by three slender arches of bone which had formed around the infected area.

Doubtless the fracture was comminuted and the pieces of bone absorbed before death.

The length of the diseased tibia is 232 mm. Measurements of 240 normal adult tibiae give lengths of 211 to 254 mm., with an average of 231.5 mm. We are thus not able to decide whether the injury and disease had resulted in a shortening of the bone. On account of the scattered, disarticulated nature of the skeletons of Pleistocene mammals in the Rancho la Brea asphalt pits it is not possible to identify the companion bone.

The osteophytes (Fig. *5d*) are abundant and many of them have needle-like points. Their nature, with the accompanying roughness of the bone, might indicate an unhealed infection at the time of death.

Evidence of an oblique fracture is seen in Figure *5c* where the large splinter of bone on the right has not completely united with the diaphysis. This splinter is quite evidently a portion of the original shaft, but I regard the other bridges as partly new bone.

I have been told that the results of injury seen in this tibia resemble the effects of a bullet wound, where the missile had shattered the shaft of the bone. This resemblance leads one to think that the trauma may have been due to a crushing bite from some one of the accompanying species of carnivores, either another wolf or a sabre-tooth tiger, bear, or lion.

RÉSUMÉ

The three examples of Pleistocene osteomyelitis are shown to be of traumatic origin, as are probably all of the lesions seen on the skeletons of this fauna, unless some of the numerous afflictions seen in the vertebrae of the sabre-tooth are idiopathic. The lesions have all healed with surprisingly little distortion, although the limbs must have been perfectly useless for a long time. It is remarkable that the animals were allowed to exist in their crippled condition for a long enough time for the bones to heal. They may have hidden themselves away in some of the numerous brush-filled canyons of the Santa Monica mountains. At least they escaped their enemies and lived for a long time before they became entrapped in the asphalt pits to which they were attracted by the cries and struggles of other animals which had been caught.

REFERENCES

1. This locality and its fossil fauna have been so widely discussed that little may be said here. The frontispiece of W. B. Scott's "History of the Land Mammals of the Western Hemisphere" gives a splendid reconstruction of a scene at the tar pits. H. F. Osborn has recently published in *Natural History* for Nov.–Dec., 1925 (xxv, No. 6, 540) an interesting account of this fauna with restorations of the extinct mammals found there. A huge collection from the asphalt beds is preserved in the Los Angeles Museum of History, Science and Art at Exposition Park. There are representative bones of nearly 900 individuals of the sabre-tooth tiger (Smilodon) and nearly 1300 individuals of the giant wolf (*Aenocyon dirus*). There are also scores and hundreds of individuals of extinct birds, camels, horses, bison, elephants, sloths, bears, lions and many other species. This collection offers the most wonderful opportunity for the study of disease in Pleistocene times that exists in the world.
2. WYMAN, L. E. Notes on the Pleistocene Fossils obtained from Rancho la Brea Asphalt Pits. Misc. Publ., No. 2, Los Angeles Museum of History, Science and Art, 1922.
3. MERRIAM, JOHN C. The Skull and Dentition of an Extinct Cat Closely Allied to Felis atrox Leidy. Univ. Calif. Pub. in Geology, 1909. v, No. 20.
4. A reconstruction of the probable appearance of this large lion is given by Osborn (*Nat. Hist.*, Dec., 1925, xxv, No. 6, 540) in the Rancho la Brea murals at the American Museum of Natural History in New York City. "This scene depicts the giant cat (*Felis atrox bebbi*) stalking a herd of camels (*Camelops besternus*) unsuspiciously approaching a water pool. The lion, as restored by Mr. Knight, is purposely spotted so as not to imitate too closely the true lion (*Felis leo*) of southern Asia and of Africa."

THE WORSHIP OF ASKLEPIOS*

WITH SPECIAL REFERENCE TO THE THOLOS AND THE THEATER

By IRA S. WILE, M.D.

NEW YORK, N. Y.

THE cult of Asklepios began with a man and ended with a god. Rauscher estimated that more than 300 Asklepieia existed; there are well authenticated references to 207, although 161 are assumed from figures of Asklepios on coins. Obviously numismatic evidence is suggestive rather than conclusive of his worship at all of the places of issue. There can be no doubt, however, that Asklepios was honored widely in the ancient world. The principal centers included Tricca, Cos, Pergamos, Epidaurus, Athens, Rome, Crete and Smyrna.

In considering various problems concerning the origin, development, expansion and meaning of Asklepios worship at different periods certain facts merit review:

(1) Apollo, god of light, youth, music and healing, was the father of Asklepios by Coronis, daughter of Phlegas.

(2) Artemis, protectress of women, was a goddess of unspoiled nature: of mountains, groves and springs.

(3) Dionysus presided over wine and its pleasures but also over all vegetation, and, in addition, he was patron of the drama.

(4) During Homeric times, Asklepios was not known as a god but merely as a Thessalian chieftain, the father of those "good" military physicians, Machaon and Podalirius. Hesiod and Pindar regarded him as a "leader of men," and "a hero." Among his other children by Epione were Hygieia and Panacea.

(5) The early education of this son of Apollo was entrusted to the wise centaur Chiron, teacher of Jason and Achilles.

(6) The serpent is an essential attribute of Asklepios, although its use as a sacred symbol antedates the Pythian Apollo. The serpent was an emblem of an earth cult; its worship was common during antiquity. Cretans and Hindus accepted serpents as companions of gods or as their favorite earthly manifestations. In Egypt healing values were ascribed to serpents and the Nagars of Kashmir serve serpent gods deemed to possess unusual medical powers. The snake has a mystic significance in rites of many sorts; it is especially held to be a magic agent of healing. The serpent became a symbol of prudence, of the renewal of life, and of the power to discover medicinal or healing plants. It is evident that the serpent attribute of Asklepios symbolized the healing potentials of nature which Asklepios personified.

Serpents also received veneration because they were variously regarded as the dwelling of the soul, the soul itself, or the symbol of the soul. Hence they became manifestations of the dead, the symbols of earth gods renewing life, of the earth itself and of gods. The intensity of these beliefs is represented in the identification of the serpent and Asklepios when his worship was transferred to Rome (293 B.C.) by means of a serpent. A temple was erected in his name at the place where the serpent landed on the Tiber's shore, after gliding away from the boat that was bearing it to stay Rome's pestilence.

This phase of Asklepios' symbolic characteristic is important, and especially so when related to the serpent themes in the life of the earlier healing god, Apollo, his father. The earth spirit concept is further supported by the fact that the principal sacrificial object in the Asklepieia was the cock, usually a sacrifice to underground spirits.

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* Read before the American School of Classical Studies, at its Summer Session, Athens, Aug. 8, 1925.

(7) Originally Asklepios was a dream oracle. The duality of man's nature as body and spirit has been recognized in modern as well as ancient times. The objective tangible body to be seen and felt was the dwelling of an unseen spirit that came and went for periods of time, thus giving rise to sleep, protracted unconsciousness or death. To consult a god with reference to one's spirit was not unusual and oneiromancy became a reasonable procedure. Thus, not merely Asklepios but Dionysus and Pluto were frequently consulted in dreams. The presence of statues of Sleep and Dream in temples of Asklepios strengthens the idea that fundamentally Asklepios was an earth spirit, who primarily manifested himself to those who sought him through the wizardry of sleep and dreams.

Cults do not arise suddenly with complete programs and fully developed embellishments. The Asklepios cult formed no exception to the rule. There were wide differences between the first Asklepieion at Tricca, in Thessaly, and the magnificent series of buildings at Epidaurus. Admittedly the course of the progressive development of the cult and its marmoreal expression is conjectural, but there are sufficient evidence, testimony and opinion to support the idea that the worship of Asklepios passed through four definite stages. Each stage involved an expansion of methods, if not of purpose, and demanded a material enlargement of the working plant together with an increased and more differentiated personnel.

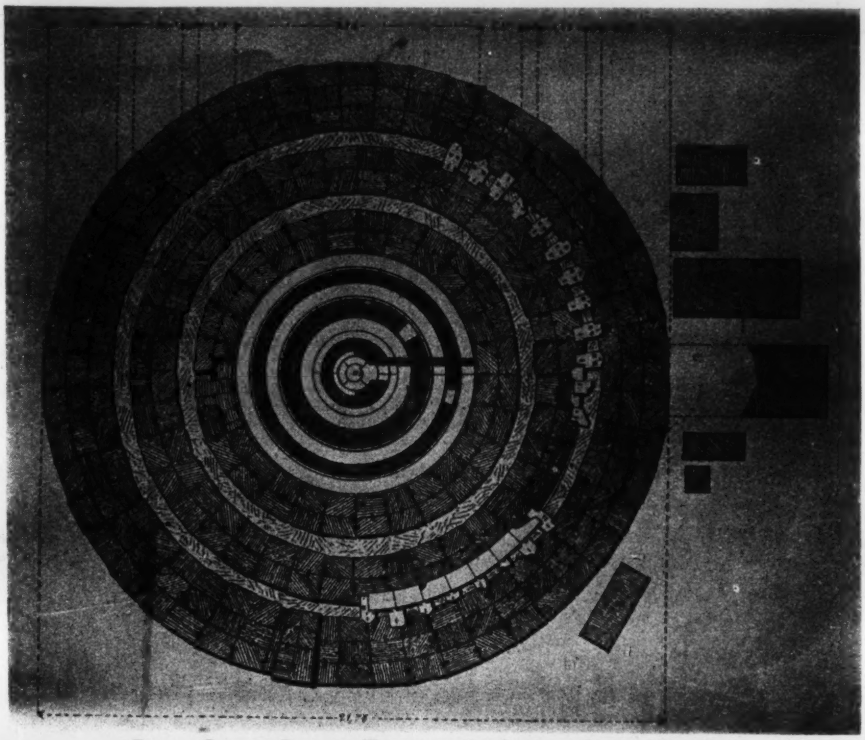

FIG. 1. GROUND PLAN OF THOLOS IN ITS PRESENT STATE (*Cavvadias*).

The earliest worship of Asklepios, the healing power of Nature personified, was simple. A grove, a spring, an altar for sacrifice were all that was requisite, with a priest, so called, in attendance. From the spring there developed baths and fountains. An early cave may have sufficed for the priest until temple building began. The earth with its beauty, productivity and water demanded only an altar for worship.

Protection of the earth spirit was solicited through sacrifice to Asklepios.

An established place of worship attracts attention and worshippers. Familiarity with human frailties broadens experience, heightens judgment and increases therapeutic potentials. The priests of Asklepios evolved a simple technique and became better informed concerning procedures helpful to the mental well-being of their patrons.

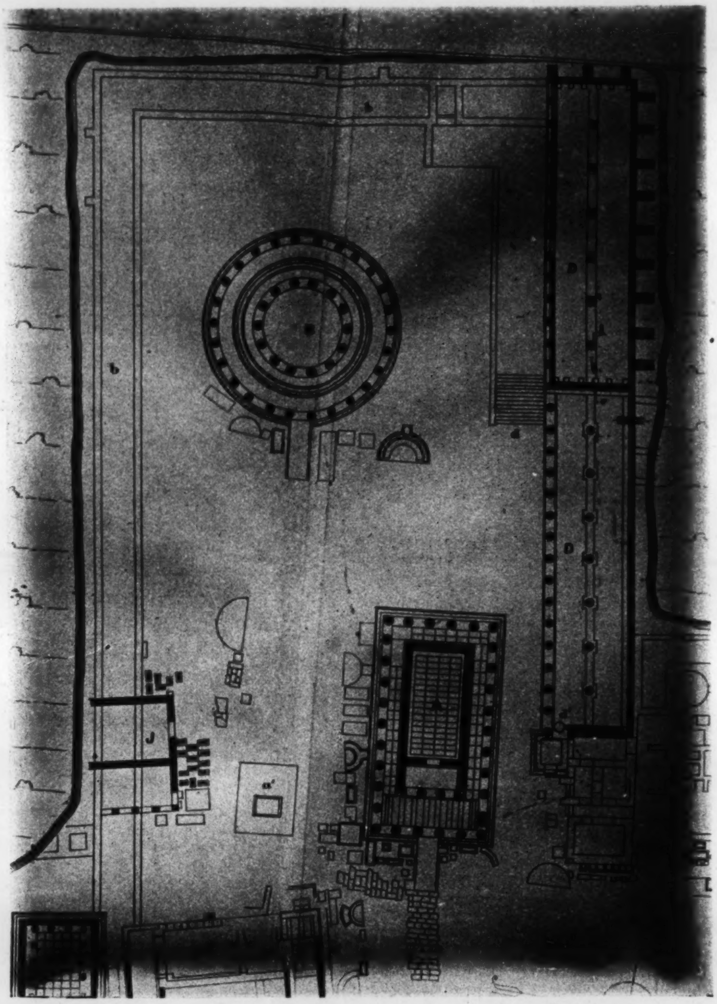

FIG. 2. A, TEMPLE; A′, ALTAR; B, THOLOS (*Cavvadias*).

The grove and surrounding grandeur of natural scenery were continued as important, while the spring expanded to baths and waters with vaunted medicinal qualities. The altar of sacrifice was no longer adequate to meet the concept of Asklepios and temples were constructed in which incubation was practiced. The increase in devotees required an enlarged priestly staff, for whom homes were erected.

Increased reputation for health service promotes popularity. The priestly astuteness recognized the value of specialization and some of the priests devoted their full attention to therapeutic arts, while others retained their original devotional and sacrificial functions. With increasing insight into human psychology, the priestly and secular administrations expanded their program and added necessary buildings. This period gave rise to the theater and the gymnasium within the sanctified area. Other temples were added, especially those erected in honor of Artemis. Hotels were built to accommodate the increasing host of visitors. Asklepios worship was evolving along therapeutic lines.

The health resort idea proved successful, and priests, though helpful in the sanctuary, were no longer capable of carrying on all the developing undertakings. Physicians entered the sacred places and served the ever-growing clientele, while the priests devoted themselves to the functions involved in the direct relations to the god as in sacrifice and incubation. The already numerous structures were insufficient in number and extent, so there was further expansion by means of colonnades, solaria, exedrae, stadia and so forth. The Asklepieion was now at its height of development, possessing a staff of priests and physicians to meet man's demands for protection against diseases or relief from them. The sanctuary remained but it no longer constituted the entire place of worship which now had spread over a large sanctified area.

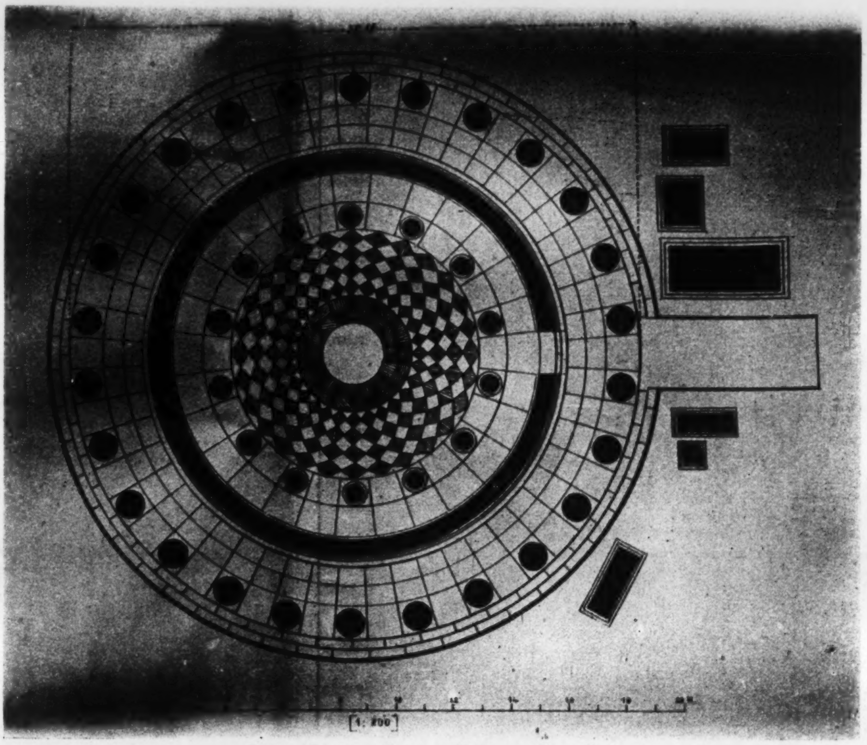

Fig. 3. Ground Plan of Tholos (*Cavvadias*).

There is ample support for this somewhat formal theory of evolution of the sanctified areas of Asklepios worship. Apollo averted illness and an Apollo temple preceded the Asklepieion at Epidaurus. As Farnell suggests, the early idea of demoniac possession made it rational to appeal to a god to avert death. An approach to retain health was appropriately spiritual and supernatural rather than a recourse to physical methods. Upon Asklepios fell the healing mantle of his father, Apollo; and his temple at Epidaurus, for example, was built upon the site of an earlier Apollo temple. Cavvadias in his monumental work on Epidaurus, states of the Asklepieion, "c'était un lieu sacré." But he also adds: "La réputation de ce sanctuaire vient donc de la crédulité des hommes au *miracle.*" He implies that the numerous structures had a precedence in need by recognizing an order of erection: the altar followed by the temple, the theater, the tholos, the abaton, to which were added other temples, the stadium, houses for priests and hotels. As Asklepios worship developed, revenues increased and the administrations were enabled to embellish the sanctuary and to make the visits of the worshippers more agreeable.

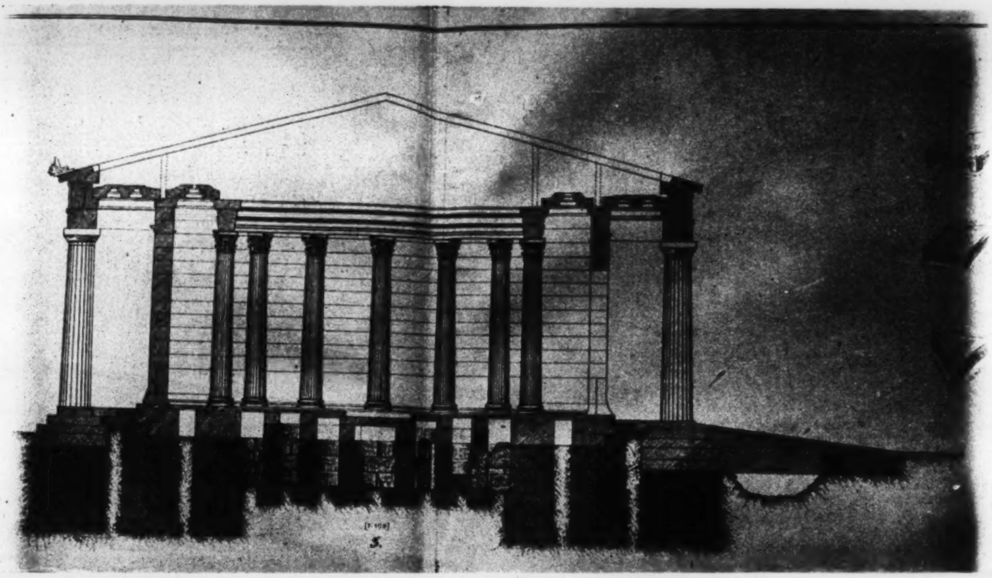

FIG. 4. RESTORATION OF THOLOS (*Cavvadias*).

Whibley notes that the temple ritual was only a part of the methodology involved in the splendid apparatus of the Asklepios cult. He suggests that temple medicine was built upon earlier secular medicine. This is unlikely in view of the fact that Celsus gives credit to Hippocrates for separating medicine from philosophy and makes no reference to the combination of medicine and religion. Nor indeed does Herodotus refer to the supernatural origin of pathological states. There is further suggestion that secular medicine as such played little part in the early practices of the Asklepios cult in the failure of Hippocrates to refer to the shrine. Hippocrates, born of Asklepiad family, 460 B.C., and living at Cos where a highly reputed Asklepieion flourished in his day, ignores its existence in his writings, though it was alleged that he secured the foundations of his medical knowledge from Cos. It is striking that he does not dwell upon the practice of incubation at the Temple at Cos, because during his age there was a widespread belief in the supernatural origin of dreams which played a significant part in the diagnosis and treatment of disease. On the other hand one is struck by the fact that one of Hippocrates' main books is devoted to airs, waters and places, which constituted the physical and psychological foundation of Asklepios worship.

The first temple of Asklepios was probably at Tricca, Thessaly, where Ziehen reports the discovery of a spring and a temple but no further structural accessions. The most celebrated place of worship was at Epidaurus and its expansiveness merits special attention. At Epidaurus there had been a well-known shrine to the Maleatos Apollo, which served as the physical and spiritual foundation of the Asklepieion. But an altar to Asklepios was erected virtually two generations before the temple was constructed (Lechat). In its complete organization Epidaurus presented a grove, an altar, the temple, a sacred well (tholos), a theater, gymnasium, baths, colonnades, exedrae and a stadium, together with temples to other divinities. The sanctified area of Apollo at Delphi also possessed a grove, spring, temple, theater, gymnasium and stadium.

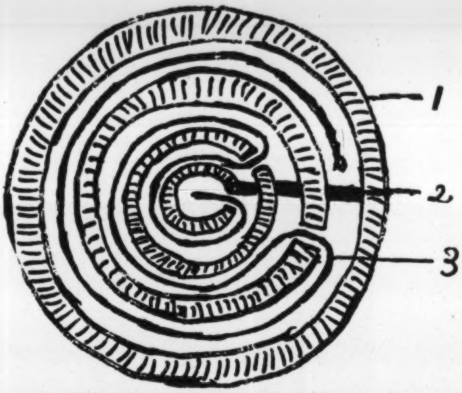

Fig. 5. Suggested Serpentine Form of Tholos. 1, Wall Bearing Roof; 2, Connecting Walls; 3, Serpentine Way.

The similarity of structures utilized in these two localities attests a close relationship between Apollo and Asklepios. This is emphasized by noting that at Olympia, Zeus was honored by a grove, altar and temple, a gymnasium and stadium. Games were held at Delphi and Olympia. A theater, however, does not appear within the sanctified areas of Zeus, Athena or any other of the Olympian host. In Athens, Asklepios worship, on the south side of the Acropolis, presented a sacred spring, an altar, a temple, baths, gymnasium and colonnades, while a theater was nearby and a stadium was not far distant. Frazer in his commentaries records that the Asklepios sanctuary was reached by a ramp from the theater of Dionysus, in which the priest of Asklepios had one of the reserved seats of honor. Caton, writing obviously under the influence of Cavvadias, referring to the theater of Dionysus, states it "was doubtlessly frequented by the sick as a diversion." Incidentally he mentions that the stadium also was visited by convalescents.

There is little doubt that the combination of a series of structures consecrated to the name and honor of one god and not noted in the worship or rites of another divinity speaks for their being at some time an integral part of the machinery of that special worship. Hence I regard these elements, including the theater, gymnasium, stadium, colonnades, as representing the evolution of structural means of giving increasingly complex methods for yielding results from the worship of Asklepios. Hence all these structures may be regarded as belonging within the sanctified area as distinguished from the sanctuary. This holds true at Epidaurus just as at Delphi one differentiates the sacred temple limits from the entire area sacred to Apollo. It is logical, therefore, to conceive Asklepios worship as dynamic, expansive and evolutionary in structure and function. Worship over a period of centuries undergoes alterations, as does the art of healing. The combination of spiritual and natural healing called for constant modification in methods. The needs of man and the worship of a god varied during the centuries and led to the induction of new rites, methods, forms and purposes, involving larger revenues and extensive building programs.

Among the structures at Epidaurus which have provoked discussion none possesses the speculative charm of the tholos, "La Rotunde." Its unusual structure raises definite questions as to its purpose and meaning. The central portion of its ruins consists of three concentric circular walls, broken by arched entrances. The three walls are joined by two walls in a line so that while it is possible to go from one circular space into the next inner one, a complete traversal of either of the two outer circles is impossible (Fig. 1). Outside of these three circular connected and connecting walls is another circular wall to carry the cover of the subterranean structures, while a fifth supporting circular wall exists to carry a colonnade. The third and fourth walls are also joined together in the same manner as the second and third walls and in the same line. What was this strangely constructed building and why did it possess its unique structural form? I am proposing an answer to these questions which appears to account adequately for its form, location and purpose.

H. Lechat regarded La Rotunde as a spring or sacred well flowing through passages to a central shaft, which he supposed to be open at the level of the floor. In partial substantiation of his concept he quotes Desmonceaux, who visited the place in 1669, and referred to "un rond avec un puit au milieu." Cavvadias rejected the idea that the Tholos was a water source and deemed it to be a place for statues and for sacrifices or secret rites. Caton, revealing the influence of Cavvadias, suggests that the well-like structure between the temple and the spring at the Asklepieion on the south side of the Acropolis in Athens was a serpent pit "similar to the Tholos at Epidaurus." Patently neither of these explanations casts light upon the reason for

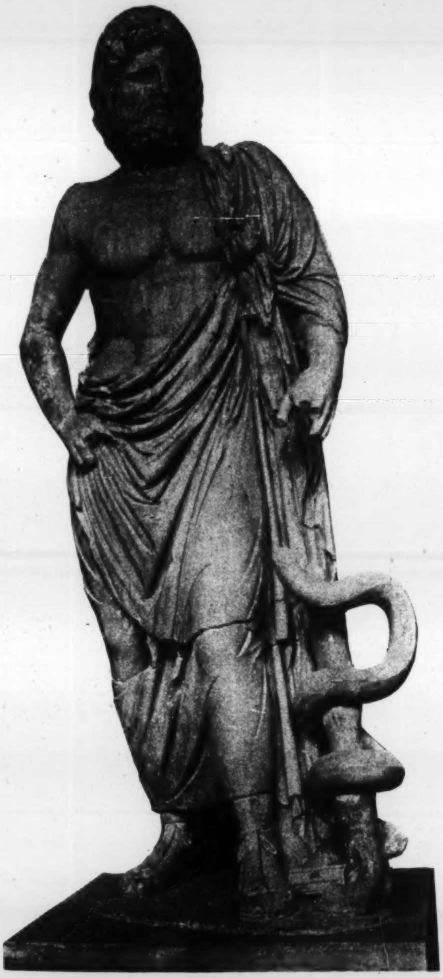

FIG. 6.

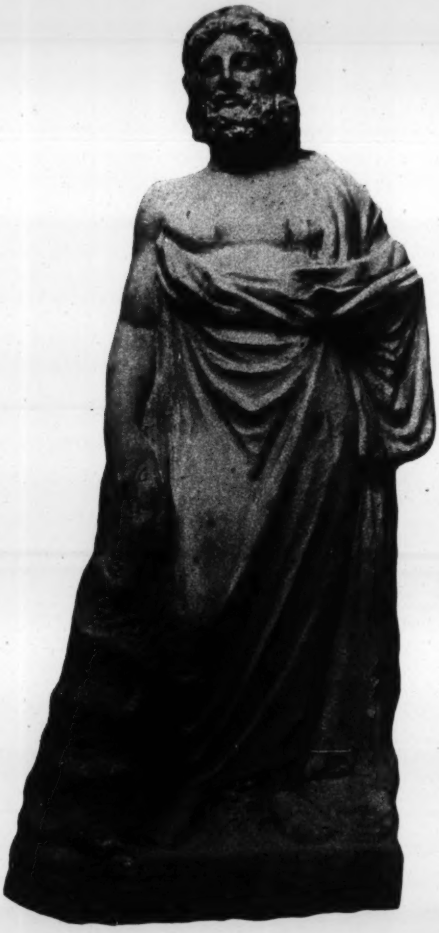

FIG. 7.

FIGS. 6 AND 7. FIGURES OF ASKLEPIOS SHOWING SERPENT WITH ONE COIL. NOTE THE FINAL RECURVATIONS ARE WELL SHOWN.

the peculiar structure. It is noteworthy that springs formed an essential part of Asklepios worship just as they were employed in connection with oracles (Amphiaraus at Oropus or Trophonius at Lebadeia). The first act of worship was bathing in sacred water and Asklepieia were usually located near springs alleged to possess medicinal qualities. Bearing this in mind, it will be recalled that the Tholos was located near the Temple at Epidaurus and indeed was reached by a ramp from the Temple, indicating frequent usage and facility of approach. Further the Tholos faced east, as did the Temple, but it also faced the ancient altar which was slightly west by south of the Temple (Fig. 2). The Tholos was within the sacred enclosure of the temple, connected with it, and faced east toward the great altar of Asklepios. This important position becomes more significant when its size and appearance are considered. The restoration at Epidaurus shows a magnificent circular marble temple with many Doric and Ionic columns supporting a beautiful casseted ceiling. Intertwined serpents are freely used in the scheme of decoration. A glance at Figures 3 and 4 suffices to demonstrate that the Tholos was no ordinary structure, but possessed a position of honor and probably was closely bound up with the worship of Asklepios.

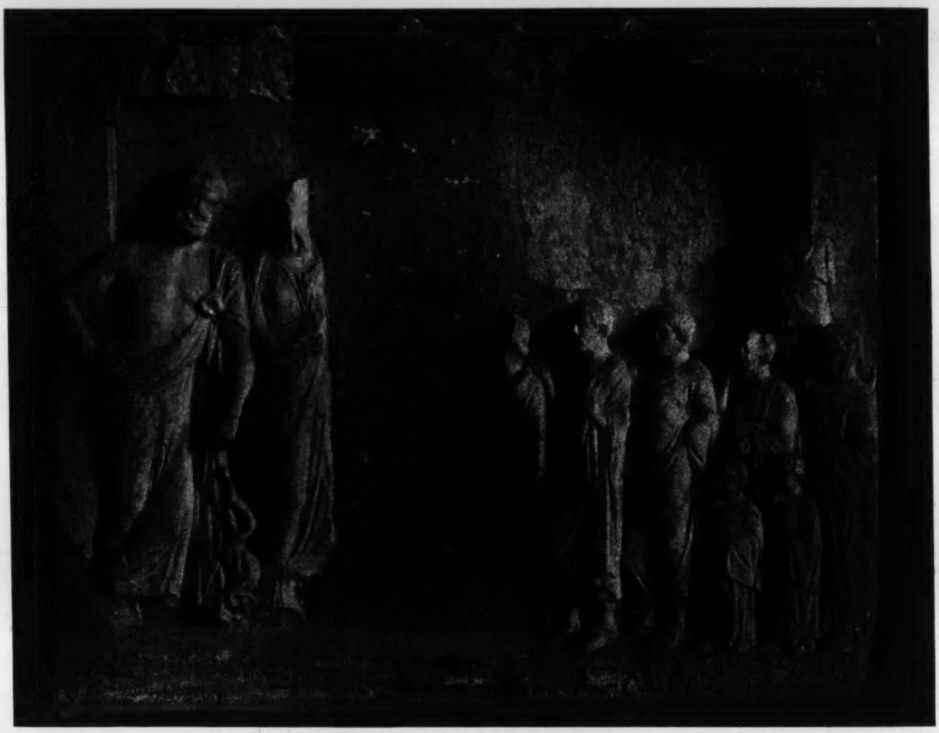
FIG. 8. SAME AS FIGURES 6 AND 7.

There was need for a spring or well near the sanctuary under the control of the priests. The Temple itself contained none, save the water source connected with the sacred image of the god to prevent its shrinkage. The Tholos with its ramp suggests its usefulness as a sacred well and this appears to harmonize with the quoted observations of Desmonceaux. This purpose, however, does not account for the size, grandeur or form of the Tholos, which merit careful consideration.

The Asklepieion at Epidaurus, as mentioned above was located on the site of an old Apollo temple. Asklepios was Apollo's son and the serpent was an attribute to both of them. The serpent played a larger part in the Asklepios worship than at the shrines of Pythian Apollo. It is evident that at Epidaurus a serpent shrine would have a dual force at a shrine of Asklepios built upon foundations of Apollo worship. Hence I believe that the Tholos was a symbolic serpent structure. This hypothesis will account for its position facing east toward the altar of Asklepios and connected directly with the main Temple within the sacred limits.

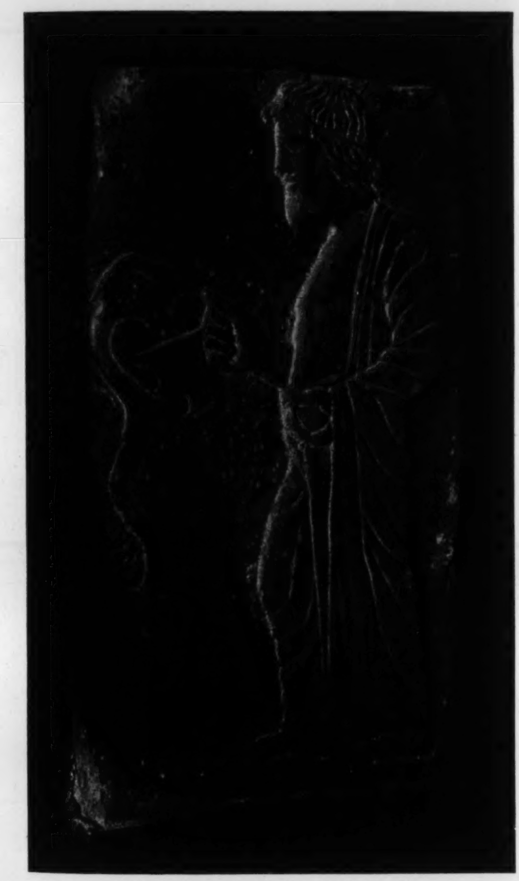

FIG. 9. SAME AS FIGURES 6, 7 AND 8.

Several factors lend support to this point of view. Serpents were frequently employed as guardians of wells and especially those possessing real or alleged salutary powers. The Tholos probably contained a well, if one accepts the testimony of Desmonceaux and the idea of Lechat. A sacred well or spring in a serpentine structure would not be unnatural at the Asklepios shrine at Epidaurus, not merely because serpents were common there but because the serpent was the symbol of the earth god and the healing god Asklepios. The splendor of the temple as reconstructed suggests that it was of particular importance. Psychologically, what could be of greater potential aid than a sacred well in the honored serpent form?

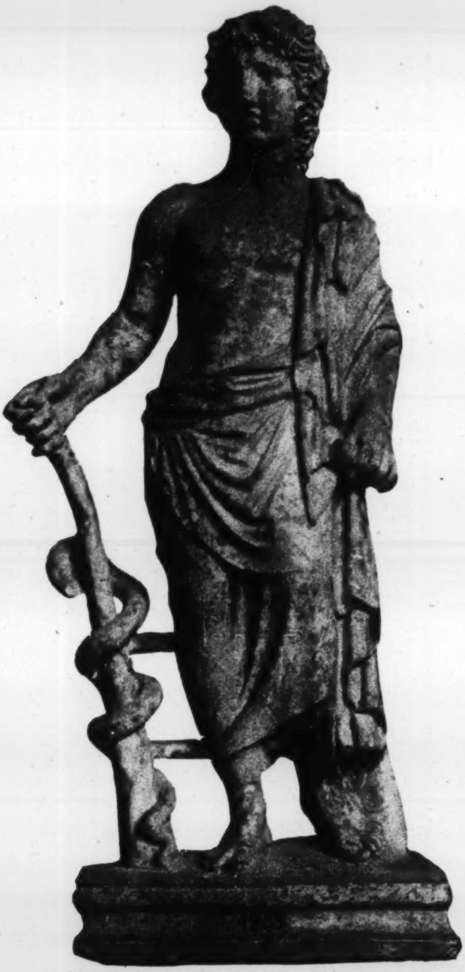

FIG. 10. FIGURE OF ASKLEPIOS AND A SERPENT WITH TWO COILS.

The unusual building type proves upon closer observation to be serpentine in form. There are few complete spiral turns, to be sure, but there is a suggestion of continuous coils. As traced in Figure 5, there appears to be at least one complete turn and then a curling back upon itself to a point of egress from the outermost of the three inner concentric walls. Possibly the serpent form may have been carried out further, as I have indicated between the third and fourth walls. This interpretation, at least, takes account of the connections between the four concentric circular walls. This arrangement is not found elsewhere than at Epidaurus and must possess a definite purpose, and that purpose does not lie in the direction of supporting weight or buttressing walls. It would appear rather to affect internal contours for some specific end.

It has been urged that the breaking-up of the circular channels produced currents within the well. This is unreasonable because the entrances from one channel to the next outer already provided for free water movement. And indeed in a close subterranean well there could be little increase of current without a free access of air, which these partitions hampered. The idea of the Tholos being a place for mummery is not strengthened by the presence of the joining walls, inasmuch as hollow sounds would be louder and more vibrant in unbroken compartments. If there had been no well, and mummery had involved wandering through a labyrinth to a spring, the serpent form would have had a greater mystical and terrifying meaning for the suppliant. There is little evidence to sustain the theory that the Tholos was a place of sacrifice. Firstly, it faced a great altar; secondly, the restoration from ample material yields no trace of a sacrificial altar or pit or marks of drainage. Nor would its use as a place of sacrifice explain its unusual fundamental structure. It assuredly never was utilized for incubation.

FIG. 11. SAME AS FIGURE 10.

If it was a serpent pit, which is of course possible, its serpentine form would be easily understood. Its subterranean walls are higher than usual for a serpent pit, but that is not of serious moment, as entrances existed to all parts of the underground corridors. As a serpent pit it was possibly somewhat removed from the temple proper wherein the priests were wont to utilize the serpents during the times when their symbolic therapeutic arts were developing. The serpent pit idea, however, is not out of harmony with my interpretation of the form of the Tholos, though I am inclined to accept the idea that there was "un puit au milieu."

As mute witnesses to the similarity of the Tholos form to the serpents of Asklepios I present a series of pictures of the serpent of Asklepios as noted in statues of the god or on votive offerings to the god. Most of the photographs were made at the National Museum at Athens, without any selection save that of order of observation. In connection with this article they were arranged according to the number of complete turns the serpent makes around the staff. It is patent that the largest group (Figs. 6, 7, 8, 9) makes but a single turn and then recurves along the staff. The next to largest group presents two full coils (Figs. 10, 11, 12) and the smallest group offers three twistings (Figs. 13, 14). All groups demonstrate the reversed coiling of the serpent at some point; the most of them present it toward the head end at the top of the staff. If Figure 6 or Figure 7 were drawn as viewed from above, the outline would parallel that of the assumed serpent form of the Tholos subterranean chamber. To represent almost any of the single coil group in building form would result in a Tholos-like conformation.

FIG. 12. SAME AS FIGURES 10 AND 11.

The serpent of Asklepios was not only a symbol of the god but at times was identified with him. Does it not appear reasonable, then, to regard the Tholos form as purposeful: a symbolic manifestation of Asklepios facing his altar, a serpent form housed in a magnificent, ornate, columned building? The physical evidence certainly sustains the hypothesis, and the theory is in accord with the tangible facts concerning Asklepios and his serpent.

The theater at Epidaurus in its splendid preservation faces the sanctuary of Asklepios, although it is approximately one-quarter of a mile distant from it. On the south side of the Acropolis in Athens the theater of Dionysus faces away from the temple of Asklepios, but it is noteworthy that the two are connected by a ramp. It is important also that the priest of Asklepios had an inscribed special seat in the theater of Dionysus along with other notables. These facts would seem to indicate that the relationship between the theater and the temple was close, particularly in view of the presence of the ramp. At Epidaurus, as noted, the theater faces the sanctuary, although the topography of the situation would have permitted its facing away from it. At a distance of one-quarter of a mile sounds or disturbances could scarcely penetrate the essentially sacred precincts. At Athens the situation likewise was protective of the quietude of the healing temple.

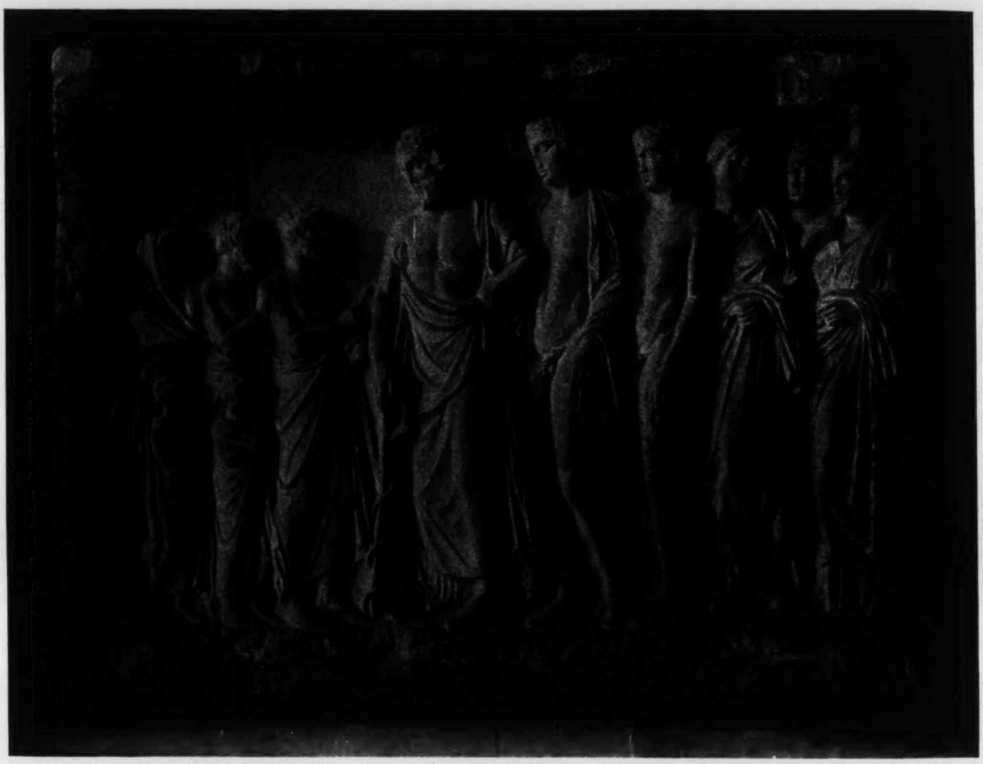
Fig. 13. Figure of Asklepios and Serpent with More Than Two Coils.

While theaters were numerous throughout Greece, I believe that their presence in combination with the worship of Asklepios indicates a purpose beyond the mere entertainment of visitors. I am suggesting that the theater formed an integral part of the mental hygiene phases of Asklepios worship, and that it was not merely a place for art, but was utilized for improving the morale and spirit so as to better the art of living.

Admitting that the worship of Asklepios fundamentally involved the use of fine air, pure water and exalting scenery, and often was located at or near medicinal springs, does not exclude the introduction of man-made institutions in the course of its development. As Whibley comments: "Besides religious rites were physical and moral influences, as dreams, games, social amusements, diets, gymnastics, and perhaps a few drugs." And again: "Air, water, place, regimen, mental exaltation, diversion or repose were later distinguished from priestly ritual." In our earlier suggestion concerning the evolution of the cult practices, distinction was made between the essentially priestly methodology and other instrumentalities designed to improve physical well-being by procedures even to this day recognized as diverting, stimulating and inspiring. Those responsible for the good name of Asklepios probably were not slow to appreciate that this *vis medicatrix naturae* was enhanced by every effort to perfect the stability of the body and the equilibrium of the mind. Certainly, mental diversion, repose and the elimination of introspection were valuable aids in securing relief from mental disturbances.

FIG. 14. SAME AS FIGURE 13.

There is a certain impressiveness in the fact that the theaters were not actually accompaniments of the worship of other gods. There is evidence that theaters were frequently located in the neighborhood of the precincts of Asklepios and were more commonly found there than within the precincts of Apollo. It is not a mere accident that the theater was utilized to some extent in connection with Apollo worship and to a still greater extent in Asklepios worship. One feels an inherent truth in Whibley's comment: "By pomp, splendor and ancient enchantments senses were captured and the springs of nervous energy unsealed; sorceries and impostures may have entered more or less into their system." The theater with its practical value for capturing the senses and unsealing energies was not sorcery or imposture, but was indeed religious with a healing power reflecting credit upon the worshipped Asklepios.

The presence of the theater could not violate ancient Greek traditions, or lower the dignity of the powerful god. Greek education had its traditions of gymnastics and music utilized for moral effect. The theater was thoroughly in consonance with the spirit and motivation of Greek education. It made use of principles which were psychologically sound in adapting educational practices to the healing art. The singing of hymns and dancing were not uncommon in celebrations attendant upon the worship of Delphic Apollo, as referred to by Homer and in the Hymns to Apollo. Hesiod refers to the adoration of Apollo in Crete through the medium of the dance. This is thoroughly understandable, as dances were first an inseparable part of the religious ceremonies of the Greeks. Consequently the theater at Epidaurus represented a rational utilization of the dance and chorus, possibly as an outgrowth of religious ceremony, but certainly as part of a natural form of worship.

This view is further supported by the Greek concept of dancing as a method of promoting the harmony and beauty of the body. Dances represent emotional states that have a contagious influence upon the beholders. It is not difficult, therefore, to reconcile the emotional demonstrations at the theater as part of a design to influence the emotional attitudes of those bent upon securing relief at the hands of Asklepios through the medium of his priests. Even assuming that the theater was generally open to the populace, it is patent that its function would logically be to promote the health-yielding spirit within the domain of Asklepios. From this point of view one is not illogical in assuming that the theater was not a mere incident, but a practical device. Where no other theater existed one was built near the Temple, but when, as at Athens, a theater to another god was available, it did not become necessary to erect a special structure. In a sense, therefore, the theater at Epidaurus may be regarded as within the sacred domain of Asklepios, even though located somewhat remote from the sacred precincts. It is somewhat analogous to the sacred olive grove at Delphi which was even more distant from the shrine of Apollo.

The presence of gymnasia, stadia, baths, colonnades and hospices indicates further extensions of applied hygienic principles. Asklepios tells Agistratus in a dream that in order to cure his headache and insomnia he should take exercise. Personal hygiene was of importance and thoroughly in accord with the Greek idea of worship of the body beautiful, vigorous and self-controlled. Strabo describes athletic games at Cos in honor of Asklepios.

It is unnecessary at this time to enter into further details concerning the purpose of the colonnades, the exedrae, solaria, the medicinal springs and the baths. Their relationship to the development of the body and the spirit is exemplified in the procedures at modern sanatariums and spas.

A general résumé of the theurgical stages of development of Asklepios worship will reveal its natural evolution from the simplest to the most complex form:

The first period began with the personification of the healing power of Nature, leading gradually to the development of temple medicine. The belief in the supernaturalness of dreams was common earlier in Egypt and pervaded the shrines of Apollo, Aphrodite and Hera. It was natural, therefore, for the Greeks to seek a supernatural god for assistance in and through dream manifestations. Hence arose the method of incubation, during which Asklepios worked as a god and not as a physician.

The procedure of this first stage was simple. The suppliant bathed in the sacred waters, made the sacrifice and then went through the process of incubation for one or two nights. The success of the god depended upon the credulity of those who sought his aid.

This first stage was one of miracle working. Records of cures indicate the wonderful works of the god: Cleo had been with child for five years; after one night in the dormitory a son was born, who on the morn washed himself in the sacred waters and betook himself from the shrine. A skeptic, all of whose fingers save one were paralyzed, came to the shrine and during his period of incubation dreamed of playing dice, during which process the god straightened out his fingers. There was also the interesting tale of Pandarus, who came to the shrine seeking to have removed some letters branded upon his forehead. He dreamed that Asklepios bound a fillet about his head and bade him take it off and dedicate it to the god. Lo! in the morning the brands were no longer upon his troubled forehead, but had been transferred to the fillet.

These are illustrations of recorded miracles, possibly not to be taken too literally, but nevertheless serving at the time to enhance the reputation of Asklepios, regardless of the extent to which the priests were responsible for the tales. It is obvious, in the light of present-day experiences, that the mere attribution of miraculous cures attracts large numbers of those who suffer from functional and organic diseases. An influx of suppliants would give the priests a large degree of experience in the management of disease and more particularly of the individuals disturbed, whether complaining of the body or of the mind. It is but natural, therefore, that the original functions of the priests should expand somewhat from the original ritual basis; and the second stage of development naturally followed.

The second period represented worship of Asklepios under the direction of priests, who were now beginning to make special efforts to cure their clientele by advice and guidance. With the limitations of the human mind, credulity with blind faith in the god became modified to faith in the priests, who, in a sense, became guides in mental hygiene. To supplement their personalities they began to play upon the imagination of the suppliants by recourse to mummery and through the utilization of sacred animals. Previously, sacred serpents had been used, as described in Plutus, and they constituted an attribute of Asklepios, and in a sense an animalization of him. It was logical and impressive, therefore, to employ serpents along with the interpretation of the dreams of those seeking the aid of Asklepios. Similarly sacred dogs were of service, because, as alleged by Festus and Lactantius, Asklepios had been suckled by a bitch, although Pausanias states that he had been suckled by a goat and guarded by a dog. The employment of such sacred animals, combined with the special attention of the priests, resulted in cures that have been attested by votive inscriptions. There was Thyson, the blind boy, whose eyes were licked by a dog of the temple and his sight was restored. Also there was the man with the ulcer of the toe who was healed by the lick of the sacred serpent, while he lay asleep.

It is apparent that with priests making special therapeutic efforts, supplementing their ritual activities, new factors would enter into the development of worship within the sacred domains. The personal reputations of the priests for effective service added to the reputation of the god. Again an increase in popular favor followed and larger numbers of people applied for relief, particularly for functional difficulties, it being a principle that no one might die within the sacred precincts.

The third stage of development brought about a division of priestly functions. One or more priests retained the control and direction of the purely ritual, incubational and animalized assistance, while another one or group devoted themselves to the practical application of the principles that had been evolved in order to achieve cures along lines less theistic, though in the name of the god. Through experience their medical knowledge had accumulated. With the enhancement of their reputation for curative power there was an influx of the sick and the maimed. In all likelihood those seeking aid were not of the most prominent or reasoning type. Temple medicine or recourse to the shrine of Asklepios was never recommended by Hippocrates, even though he recognized the virtues of air, water and places, and he lived within influence of the sacred shrine at Cos. Faith in the god and the priests was strengthened by the increasing lay reputation. The secular and lay administrators of the sacred precincts were virtually obliged to establish and maintain a sanitarium. Those seeking relief were psychically aided by the presence of votive offerings and testimonials, not merely from those who had been cured but from those who had earlier solicited aid. The broadened type of treatment now afforded is well illustrated by the experience of Apellas who underwent nine days of treatment for indigestion. The first item of advice was not to get angry, and then followed directions as to diet, exercise, bathing, the making of sacrifices and last, but not least, the necessity of paying the honorarium. No comment is required upon the belief that even as the cure had been wrought the disease and suffering of the patient could be returned to him in the event of his failure to make an adequate monetary compensation.

During the course of time the reputation for healing reached a peak. There was no real need for miracle cures alone and indeed miracles no longer made a great appeal to those who sought relief. The ill flocked in still larger numbers and the necessity for a greater variation in treatment gave rise to a more extensive institution than could be characterized as a sanitarium. Hence, there came about the final stage of evolution into a hospital.

In the fourth period priests retained their position of prominence but their services were restricted to lines not requiring definite medical attention. Physicians are now found working in harmony with the priests during the first or second century A.D. Surgery and the use of drugs began to supplement to a large extent hypnotism, miracle working and oneiromancy. From this time there began the establishment of the Asklepiadae, a caste or order of priests possessing a considerable knowledge of medicine which was held to be secret and passed only from father to son. This Asklepiadic point of view was thoroughly out of harmony with the dictates of the free teaching of medicine so ably espoused by Hippocrates.

Originally Asklepios was not the god of medicine; his worship throughout the ancient world was a normal response of Nature-fearing people to the majesty and power of Nature. Asklepios, the hero father of valiant physicians, became heralded as the son of the god of light, youth and healing. The wise man, tutored in healing arts by Chiron, became a dream oracle. The evolution of his worship was subject to the influences of natural phenomena, including man's own reaction to Nature and to himself. Asklepios in the sanctuary was transformed into Asklepios, the guiding spirit of a health resort, and finally into Asklepios, the godly patron of a hospital. But he ever remains a god of healing, a specialized Apollo Alexikakos, reflecting the reverential attitude of the Greeks toward supernatural medical skill. He might have voiced the words of Empedocles of Agrigentum:

. . . But unto ye I walk
As god immortal now, no more as man,
On all sides honored fittingly and well,
Crowned both with fillets, and with flowering wreaths.
When with my throngs of men and women I come
To thriving cities I am sought by prayers,
And thousands follow me that they may ask
The path to weal and vantage, craving some
For oracles, whilst others seek to hear
A healing word 'gainst many a foul disease
That all too long hath pierced with grevious pains.

AYURVEDIC MEDICINE IN ANCIENT AND MEDIEVAL CEYLON

By CASEY A. WOOD, M.D.

SRINAGAR, KASHMIR

FOR more than a year I have been collecting for McGill University, Montreal, examples[1] of the medical and surgical material used by the old Vederalas,[2] or native doctors, of Ceylon. I have, in consequence, acquired some knowledge, albeit fragmentary and superficial, of medical practice in this remarkable island during the early centuries of its history, and I now propose in this brief paper to pass on my impressions of the medical activities of Ceylon when it was a highly civilized native kingdom or group of kingdoms. The present notes do not, therefore, treat of present accomplishments but of past glories, of a time when the profession kept pure the faith as it was delivered by Charaka and Susruta during those centuries when all *our* fathers worshipped the stocks and stones of a savage pathology and a barbarian therapeutics.

Of the present British colony it may be said that the aborigines are unknown, unless a few hundred jungle Veddahs are their survivors. About 545 B.C. an Indian rajah became the first king of Lanka and introduced the Hindu religion into the country. Succeeding him were 160 kings and queens, whose doings constitute the historical record of ancient and medieval Ceylon. Now and then an unusual man or woman came to the front (individuals who would have been distinguished in any country or clime) and these have left their political and social marks on the land. Just before and shortly after the Christian era, Sinhalese rulers built immense irrigation reservoirs and erected huge temples and palaces. At the present day, the buried cities and other ruins of a once mighty kingdom are second only to those of ancient Egypt. A long line of chieftains continued the labors of these potentates and added many public works to the list of enterprises inaugurated by their predecessors. Among these were hospitals, dispensaries and medical activities of other kinds, traces of which still survive. In the course of time, the whole country was well supplied with evidences of an advanced and enlightened government, not the least being thousands of artificial tanks for irrigation and sanitary purposes.

One of these is twenty miles in circumference and includes a stone-reinforced embankment, or *bund*, twelve miles long and (in places) ninety feet high. Many of these tanks still supply villages and towns with water, impounding the intake of a considerable number of streams.

In A.D. 1505 Portuguese adventurers conquered and colonized the maritime districts of the island, and for 150 years exploited its resources and inhabitants. The Dutch, in 1656, expelled the Portuguese and did something to justify their occupation of the country; for example, they built roads and constructed canals. The Hollanders were succeeded by the British in 1797, who finally, in 1815, conquered the whole island. Until the last date, the Kandyan kings, secure in their mountain strongholds, successfully defied all invaders.

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[1] In the libraries of the Medical Faculty may now be consulted most of the important island *Olas* (book-manuscripts) in Sanskrit, Pali-Sinhalese and Sinhalese dealing with medical topics; also such printed Sinhalese and English translations and transliterations of them as are mentioned in this paper. In the Medical Museum may be seen a fairly representative collection of professional armamentaria of the Ceylon Vederalas. These are chiefly ivory, ebony, silver, copper, brass and horn boxes and other containers, some of them elaborately carved, lacquered and otherwise decorated in the styles of the thirteenth to seventeenth centuries. In purely surgical instruments and appliances the collection is woefully defective; with the exception of a few medieval eyeglasses with quartz lenses, it furnishes a poor idea of the outfit of a fifteenth century Sinhalese surgeon. Operative implements of the early types are now rarely found in Ceylon; the original and meager supply is almost entirely locked up in public and private collections whose contents are not available for outside demands.

[2] Sinhalese transliteration: *Vederala* (Vedarala), singular, doctor; *Vederalo* (Vedaralo), plural, doctors. English usage, *Vederala* (or Vedarala); plural, *Vederalas* (or Vedaralas).

Although much reduced in numbers by war and disease (mainly malaria and fever), the native and mixed races still number over four million. At the present time, there is probably no more favored tropical island in the whole world, combining as it does a most attractive wild jungle country with all the conveniences of a settled and prosperous land. Even the unoccupied forest lands are criss-crossed with fine motor roads and picturesque railways.

This is not the time or place to discuss fully the influences exerted by pure Indian medicine upon early Sinhalese teachings and practice, but it may be said that despite the Far Eastern diffusion of such ancient treatises as the "Charaka Samhita" and, subsequently, the "Susruta Samhita," Ceylon (and especially the mountain kingdom of Kandy) has always held a sort of independence in her medical affairs that is probably a part of her insular and hill-country aloofness. Nevertheless, the Indian element in ancient and medieval Sinhalese medicine is evident and important.

The Northern aspect of the case is well studied in Girindrunath Mukerji's recent "History of Indian Medicine," published by the University of Calcutta.

If one regards old-time Ceylon as a province of the Ayurvedic medical kingdom, the division of the healing art into pure medicine, as exemplified by the teachings and writings of Charaka, and surgery, as presented in Susruta's works (a much later compilation), is justified. In the same sense that the 10,000 slokas or quatrains of Charaka are said to have had their beginnings in the mind of Brahma the Creator, so is the Susruta believed to have been of divine origin.

Dhanvantari, the surgeon of the gods, personified as Devadasa, king of Benares, came upon earth to instruct mankind in surgery as distinguished from internal medicine. Susruta and five other pupils approached him for instruction and, on being asked by Dhanvantari what should be the subject of his teaching, desired to learn surgery and those related means by which the gods protect themselves against disease and death. Notes on the lectures that followed form the basis of the Susruta. As is well known, these discourses are chiefly on anatomy, surgical diseases and surgical appliances. Until quite recently, as in many other lands, the professional line between the practice of internal medicine and surgery was strictly drawn.

Those who practiced medicine exclusively were, in ancient Sinhalese days, termed *Kayachikitsa* or "healers of diseases of the body"; those who devoted themselves to surgery alone were designated *Salaya Chikitsika*. The evolutionary processes that gave a superior status to surgery, in public and often in professional estimation, are seen in the records of Ceylon. During a long period of ancient and medieval times, internal medicine was the better developed and the more highly regarded of the two, but later the scene shifted (chiefly owing to advances in operative technique) and the followers of Susruta came into their own.

In the fifth century B.C., the Vijayan invasion brought the theory and practice of Ayurveda to Ceylon. According to Charaka, this is the science of life with its various manifestations and modifications, the ancient biology. It treats not merely of the origin, development, decay and termination of man's activities but of the life-and-death cycle in plants and animals and, of course, includes medical science in all its branches, human, veterinary and floral.

One must insist upon the two last categories because, just as in medieval Europe, so in the Far East, medicine went hand-in-hand with, and indeed generally was, religion. So, too, in Ayurvedic and Buddhist Ceylon, the hygiene and therapeutics of plant and lower animal life play an important rôle. As one of numerous examples, Chapter XI of the "Charaka Samhita" tells us: "The disciples asked, how are clysters to be given to elephants, camels, cows, horses, lambs and goats?"

Again, one reads in the "Harita Samhita" that the sage Atreya lectured not only on the scientific treatment of disease in man but on the therapy of horses, deer, snakes, camels, elephants, buffaloes, mice, trees and other plants. What better demonstration of a belief in the unity of vital phenomena?

Animal anatomy was also well understood by students of the Indian Vedas. Early literature on the subject treats this attitude as a matter of course; it was an integral part of the curriculum pursued by both Indian and Sinhalese students. Comparative anatomy, as well as comparative medicine and surgery, was not studied apart, as in our day, but formed part and parcel of the ordinary doctor's equipment. The Vederalas attended a human accouchement one day and ministered to a sick elephant the next; and this common interest in the diseases of all animal life persists among native practitioners even to this day.

Although the medieval Sinhalese monks undoubtedly practiced medicine as an occasional adjunct to theology, yet there never was that complete absorption of the one profession in the other as witnessed in European monasticism during the Middle Ages. The Vederalas always appear throughout the centuries in which they worked to have formed a distinct, dignified, learned and highly respected class in the community.

In Attygalle's "Sinhalese Materia Medica" (1917, p. 216), Dr. C. T. Vaidyaratna furnishes a roster of the medical treatises, small and large, that have been and still are in use among the Ceylon Vederalas. No good purpose would be served by repeating this long list of vernacular titles. It will suffice to say that it comprises five *Nigandus* or glossaries of drugs, six medical dictionaries, three *Nidbana* or monographs on symptomatology, twenty-one collections of prescriptions and compendia on medical treatment, five *Handi-vedapot* or treatises on vulneraries, three manuals on snake bite, one, the "Sarpa Vedapota," illustrated by plates, three books on diseases of the eye and seven on ailments caused by sexual indiscretions. Although these monographs might appear to cover the medical needs of the general practitioner, there are intended for him, in particular, three treatises on the employment of medicinal oils (always considered important in a country where the supply is large and varied), eighteen manuals on general surgery and medicine in verse, several monographs on veterinary medicine and surgery, on diseases of cattle, and so forth.

The medical works published in Sanskrit, Pali and Sinhalese verse are quite common, echoes of the original Ayurveda *slokas* of the mystical Artharva Veda, whose 10,000 quatrains deal with the eight great subdivisions of Sinhalese (and Indian) practice. Briefly, they are: (1) "Salaya," or surgical treatment; (2) "Salakaya," or diseases of the head, eyes, ears and face; (3) "Kaya-chikitsa," or treatment of general diseases; (4) "Bhutavidya," or diseases caused by evil spirits (as in the case of the Gadarene swine!); (5) "Kaumara Bhritiya," or the treatment of infants and of the puerperal state; (5) "Agada," or antidotes to poison; (7) "Rasayana," or medicines that promote health and longevity; and (8) "Vajakaruna," or aphrodisiacs. In the course of time, these original treatises were superseded by the more scholarly writings of Charaka and Susruta.

According to Attygalle, the most important works of local (Sinhalese) compilation are: "Sararthra Sangrahawa," "Manjuse" and "Yogaratnakara." Another important work, not included in this list, is "Bhaisajja Nidhane."

"Sararthra Sangrahawa" is the oldest medical work compiled in Ceylon. Its authorship is attributed to the royal surgeon, Buddhadasa. It is similar in its arrangement to Susruta and, like the latter, gives an account of the surgical instruments of the day. It is composed in Sanskrit *slokas* (quatrains) like most of the other standard works on medicine, and until recently its contents were not available to the average practitioner of medicine, the latter not having a knowledge of that ancient language. An attempt was made by the vernacular press to print a Sinhalese translation, but unfortunately it appears to have been given up after the publication of a few chapters.

"Manjuse" is a work compiled about the seventh century A.D. by a priest who resided at Anuradhapura. It treats of all the diseases then known, except those peculiar to women. These, he tells us, are purposely omitted as being unsuitable for treatment by Buddhist priests. The Buddhist priests of the present day are not so squeamish. I have known several skilful priests who have treated patients of both sexes without distinction; one of them had a great reputation for his successful treatment of uterine tumors and other diseases peculiar to women. "Manjuse" was originally composed in Pali stanzas, but a Sinhalese translation has been added to it by a later writer.

"Yogaratnakara" is also one of the standard works on medicine and is written in Sinhalese verse. The name of the author is not given, but he calls himself, in one of the closing verses, *Veda kivindu* (physician-poet), and he further says that his compilation was begun in the twelfth year of the reign of King Buwaneka Bahu, who ruled in Kotte, and that it was completed six years afterwards. External evidence points to Romansura Aratchi as the author, (*circa* 1532–1538 A.D.).

"Bhaisajja Nidhane" is a comparatively recent Sinhalese work, and quite rare. I regard it as a valuable compilation, and one which would prove highly useful to practitioners of native medicine. It is said to have been compiled about 1760 A.D. by one Don Simon Tillekeratne, *Mudaliyar* (a local chieftain), a member of a well-known family of that name in the Matara District. It is the only work on native medicine in which Parangi is described in detail. The first mention of the disease now identified with the yaws of the West Indies is found in "Yogaratnakara." This fact and the name Parangi, the popular designation of the Portuguese, seem to show that the disease was introduced into Ceylon by the Kaffir soldiers who were brought to Ceylon by the Portuguese.

The oldest and most authentic of the chronicles of ancient Ceylon is the "Mahavansa." This was written on *olas* (prepared, papyrus-like leaves of the talipot and palmyra palms) about 450 A.D., during the reign of King Dhatusana, by his uncle, the learned Mahanama, a monk in one of the Buddhist monasteries. It was continued by other writers, and it has been translated into English.

Many references are made in it to the practice of medicine and surgery by physicians of all ranks, from royalty downwards. Indeed, medicine was one of the four sciences that noble Sinhalese could study and put into practice without loss of caste, and, as Attygalle tells us, a comparatively high degree of efficiency was attained by its practitioners in these early days. Even the Sinhalese kings did not disdain the practice of the profession that they might "gain merit" thereby. The best-known royal surgeons were Buddhadasa, who reigned at Anuradhapura (330–400 A.D.), and Parakrama Bahu the Great of Polonnaruwa.

The "Mahavansa" and other chronicles tell many tales of the medical activities of these regal doctors, especially of the remarkable surgical operations they performed on man and animals.

Parakrama Bahu was more of a physician than surgeon, and he, like many other

Sinhalese rulers, built and equipped hospitals in various parts of the island, traces and ruins of which still remain.

Moreover, he was not satisfied merely with spending money on these institutions. At Polonnaruwa he founded a very large hospital and passed every *Poya* day he could spare from the cares of state in attending all those who applied for treatment. He went the rounds of the wards with the physicians and joined in the discussion of those cases that appeared to call for consultation. It is related of this king that he operated successfully on a blind sufferer, thus establishing a reputation as an ophthalmic surgeon.

But it was Buddhadasa whose praises were most widely sung in ancient Lanka. As the "Mahavansa" puts it: "This wise and virtuous Raja discountenanced the wicked and comforted the diseased by providing medical relief to man and beast. And among the numerous acts of kindness and evidences of true brotherly love is his attendance on a poor Chandala woman, who, for the seventh time, was in great travail, and saved her together with her child." Here the original word *malbagabbba* is used, meaning mal-presentation of the fetus.

The compiler of the "Mahavansa" gives numerous other examples of the skill of the royal Buddhadasa, and remarks further that "out of benevolence towards the inhabitants of the island, this sovereign provided hospitals and appointed thereto medical practitioners for all villages in his realm. He also composed the well-known 'Sarathasangaha,' containing the substance of all the medical science of his day, for the information and guidance of the physicians of Lanka for all time to come." This compendium of medicine and surgery was originally written in Sanskrit; it is still extant and is described elsewhere in this paper.

The royal physician reigned for nearly thirty years, during which time he greatly endeared himself to his subjects by many benevolences. Perhaps the chief of these were his medical reforms. He appointed a municipal physician to groups of villages, and for their maintenance and the upkeep of his hospitals "set aside the one-twentieth of the produce of the fields." Following the teachings of Buddha and under other influences, we are told that "he also appointed medical practitioners to attend elephants, horses and his army. On the main roads he built asylums for the lame, the deformed, the blind and the destitute, and provided the means of endowing these refuges, so that the good work might be permanent." There is something touching about the concluding paragraph: "This man of great compassion was wont to carry his case of surgical instruments within the folds of his waistcloth to afford relief to every afflicted person he met."

Coming to more recent times, Antonio Teixeira visited the island during the Portuguese occupation and wrote, in 1588: "I cannot but disagree with those who call all physicians barbarians who are not Greeks or Latins. There have been and still are in India many physicians so excellent in their art that they are fit to be professors in any country."

A quarter of a century earlier, Garcia de Orta, commenting on that potent remedy, commonly in vogue among the medieval native doctors, of reducing the diet in cases of indigestion to the point of starvation and pointing to wonderful cures effected by this form of treatment, regrets that it was not followed in European practice. It would be, he thought, especially a good method "for the Gentiles, who eat nothing but blood," in contrast to the vegetable diet of the Sinhalese.

In passing, it may be noticed that it was not long after the Dutch invasion (1658) that Paul Hermann, a physician in the Dutch East Indian service, drew upon the stored knowledge of the Vederalic profession in his studies of the botany and pharmacology of Ceylon. He formed that famous herbarium which was afterwards used by Linnaeus in writing his "Systema Naturae."

The reputation of Sinhalese physicians continued to be high and their medical treatises were read by the learned to a considerable extent. In 1708 the King ordered Saranankara, a scholar well versed in the ancient languages, to translate into modern Sinhalese the Pali medical work, already mentioned here, "Bhesajja Manjusa."

Time and space do not permit of more than mere mention of what the Vederalas considered the most important remedial measures in the care of their patients. One may begin with a product of the well-known lilac or neem tree (*Azadirachta indica*). For many centuries all its parts have been held in high esteem as curative agents. Quite recently an intelligent Sinhalese physician writes:

> Kohombatel, an extract from the seeds, is an indispensable article in the lying-in-room of the native woman. A dose of the oil is given internally to the mother soon after delivery of the child, it is also applied to the parts, and the room is fumigated daily with it. I have seen hundreds of instances in which this procedure was adopted and the impression left in my mind is that it acts as a powerful and effective antiseptic. Thus only could the comparatively small number of puerperal fever cases we meet in native women after confinement be explained, considering the utter lack of cleanliness on the part of native midwives. . . . Even if puerperal fever sets in, as it does sometimes, the mortality is not high, according to my experience.

All which would have passed as serious and satisfactory reasoning before the days of Oliver Wendell Holmes! Certainly the author's predecessors of the fourteenth century and the Vederalas of Buddhadasa's court undoubtedly held the same opinions. I am not discussing *modern* native medicine in Ceylon, but the quoted lines define its status very well. Progress in all the arts, but especially in the art and science of healing, ceased with the dawn of the sixteenth century. The native doctors were then quite content and are now content to rest upon their traditional oars, as they slowly float along the river of therapeutic life in this charming country. Ayurvedic medical and surgical theories and practice are about the same as they were in the time of Parakrama Bahu the Great.

From the earliest times, infected injuries and other maladies of the skin and mucosa have played a special rôle in the minor ailments of the Sinhalese.

Nakedness, in spite of European prejudices, is (or rather was) a desirable condition for the tropical native, and the total or even partial covering of the body of the lower class Sinhalese rather increased than diminished this tendency to dermal diseases. However that may be, local applications for the relief of external eruptions have always been regarded as among the most important of the popular remedies. A generous share of the embrocations and emollients carried and prescribed by the Vederala were the *Tailapaka* or medicated oils. The bases of these were commonly Gingelly, castor or mustard oils, in particular the first, derived from *Sesamum indicum*. The published formulae of the compounds with these and the other varieties of *olea* readily extracted from the flora of the Ceylon forests fill several books on the subject. As a rule, each prescription combined the "elegance" (fragrance) of a modern proprietary preparation with the efficiency of the ancient remedy. Hence we find, in nearly all the many *Tailapaka*, grateful and odorous liniments containing cardamoms, cinnamon, cloves, the perfume of fenugrec (*Trigonella froenum-graecum*), saffron, sandalwood, storax, pouch of the civet cat, camphor, both animal and vegetable musk, and a dozen other less widely known ingredients. In fact, lubricant and medicated oils of every description were employed in almost every sort of ailment, from rheumatism to chorea.

Other pharmaceutic forms were *Churna* (powders), *Svarasa* (expressed juices), *Kalka* or paste (a favorite excipient made from fresh fruits or used as a remedy per se) *Kvatha* (decoctions), *Phanta* (infusions), *Yavagu* (rice and other gruels) and, last but far from least, *Modaka, Vatika* and *Gudika*, many sized and most popular pills and boluses for man and beast. The last named have been much employed by the Vederalas for more than 2000 years, and the beautifully fashioned and elaborately decorated boxes, cylinders and other containers made to hold and dispense them constitute a distinct and attractive contribution to Sinhalese art.

Finally, the roster of Ayurvedic remedies include the *Kanjika*, a sour liquid resulting from the acetous fermentation of powdered *paddy* (unshelled rice). This appears as a clear, transparent fluid with an acid taste and vinous odor. It is a cooling beverage, very grateful to thirsty patients living (and dying) in a country where, despite the efforts of British (let me add, American) sanitarians, typhoid, malaria and other febrile diseases are all too common.

Attygalle points out that this remedy is not only given internally as a drink in febrile cases but is sometimes employed as an external application on the principle of the wet pack, a method of treating continued fever associated with a high temperature applied but comparatively recently by European practitioners but well understood by Indo-Sinhalese Vederalas some 3000 years ago.

In addition to the modes of external application just mentioned, the native doctor many centuries ago invented or adopted remedial agents and methods now practiced by his fellows of the western world. These include injections into the rectum, urethra, and external female organs; the use of ointments, poultices, plasters and fumigations; inhalations, and topical applications to the nose, mouth and eyes. To this list must be added suppositories, collyria, sudorifics, snuffs, medicated fomentations of many varieties, as well as some twenty caustics and escharotics. The last were much employed in chirurgical practice for the opening of abscesses where the knife was interdicted, for the removal of tumors, and so forth.

Remedies of animal origin naturally hold a prominent place in a land of superabundant fauna. Six of the dozen varieties of leeches now plentifully found in Ceylon are non-poisonous and have for ages been utilized in minor surgery. I have on more than one occasion been successfully phlebotomized by several of these animals during my excursions through the jungle. I can testify to their efficiency as letters of blood. The common land-leech (*Haemadipsia zeylanica*) is encountered up to an elevation of 5000 feet throughout the island, when the rainfall is sufficient. It is an agile and exceedingly active little beast, from one to one and a half inches in length. Attached by a posterior sucker to the top of a grass-stem or exposed leaf, it lies in wait, waving about the air with eyes and smelling apparatus alert, awaiting the passage of its warm-blooded victim. The bite is not painful but the incision bleeds freely; indeed the first intimation the host generally has of his visitor's insult is a stream of blood trickling from the point to which the leech has attached itself. The flow is not easily arrested; iodine and collodion are the remedies.

It is not possible to speak of Ceylon leeches without thinking not only of their medicinal but of their important military and political relations. One of the chief defences of the ancient Kandyan Kingdom and one explanation of its successful resistance of foreign invasion for 300 years after the subjugation of the rest of the island lies in the vast multitudes of leeches that infested the wet impassable mountain jungle that lay between the seaboard and Kandy, and through which an invading army must march. As one of many such incidents, in 1553 A.D. a force of Portuguese soldiers on their way to attack the Kandyan king[3] "were encamped in the midst of rank grass and marshy pools infested with myriads of leeches. Clothes afforded no protection against their needle-like bodies; satiated, they dropped in streams of blood from the eyelids and ears of the men, and had to be plucked out of their very gums as they ate their food. Rest was out of the question, for the voracious animals swarmed on all sides in every-increasing numbers." The expedition failed of its objective.

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[3] Pieris, P. E. Ceylon and the Portuguese. p. 72.

Serpent poison, generally the venom of the Ceylon cobra (*Naja tripudians*), was sometimes used as a remedy in "desperate cases of nervous diseases." Animal musk from the musk deer, and civet have already been mentioned.

Opium in its crude form is rarely smoked in Ceylon, although it may be occasionally taken internally as a stimulant. There never was, as far as I can ascertain, an opium "problem" in this happy land. The Vederalas have administered it in dysentery, cholera and other diseases with "painful flux" for more than 500 years, and the "Yogaratnakara" gives opium as an ingredient of many pills and other prescriptions.

Betel chewing, almost universal in the Far East, has certain medical aspects, and as I had heard many different and contradictory statements about its prevalence in Ceylon, I hasten to say that it is quite a common practice among all classes, about as widespread as the practice of tobacco chewing (and the accompanying expectoration) was in the United States during the sixties. A chew of betel costs one-third of an American cent; it consists of the large, fresh, cordate, peppery leaf of an evergreen climber (*Piper betle*) folded around several shavings of the areca-nut (fruit of the palm *Areca catechu*), a bit of moist, slaked lime, a small quantity of dried tobacco and a few cardamoms or other spices. The objections to betel chewing are the spitting and a habit of cleansing the fingers of superfluous lime by rubbing them on the walls of houses, fences, trees and other public objects. Apologists, like Sir Emerson Tennent, assert that "the habit of betel-chewing is advantageous to a people whose ordinary food includes little or no flesh, as it provides the antacid, tonic and carminative which they require." At any rate, far better betel than the fiery, maddening arrack or even the lesser evils of the fermentations of the toddy palm. Fortunately, however, intoxication is rare among the native population of Ceylon.

The ancient and medieval Sinhalese (like most Eastern peoples) resorted to various means of driving out the spirits of evil in the shape of disease, such as tom-tom beating, devil-dancing, incantations and charms, agencies that are a familiar feature of Shamanism and "making medicine."

Although the Vederala in treating his patients generally provided such remedies as were not readily gathered from the forest or garden and prepared by the family in accord with his directions (often written on an ola-leaf tablet), there were in the larger towns and cities officials and merchants who supplied drugs on prescription, much as our pharmacists now do. Without doubt, too, there was a good deal of prescribing over the counter, and something good for a headache or an infallible cure for cough could always be had for a consideration. We are not even now in such a secure position that we can cast the first stone.

Both the doctor and the drug seller used certain seeds of uniform size (as well as small copper cuttings) and small beam scales not unlike the modern apparatus for weighing their remedies. The beautiful scarlet and black seeds of the jequirity (*Abrus precatorius*) were much in demand for the purpose, and weighed 1⅛ grains Troy; the hard, bright-red seeds of the bead tree or *Maditiya* (*Adenathera pavonia*) weigh, each, 3¾ grains; 20 *Maditiya* equal one *Kalan* or 75 grains; 12 *Kalans* are equal to one *Palama*, about one-eighth of a pound.

We may, then, visualize both the ancient and the medieval Sinhalese Vederala, whether physician or surgeon, as a dignified figure, highly regarded as a member of no mean profession. He had great influence in the community, and although his position did not permit him to indulge in trade, he lived well on the presents and perquisites that naturally accrued to one in his exalted social position. The picture I would like to draw of him has not so far been painted by any writer, but we can readily visualize him rising early in the morning, first to take a cool bath and then to go on his way to the *Vihara* or temple for attention to his religious duties. Sometimes that function was performed in his own house, where a separate room was arranged and kept with the sacred books and Buddhist images. He then had his early morning meal, generally of milk and rice.

Assuming his outdoor dress, with his (ceremonial) dagger and stylus, he placed in his waistband various boxes and bottles, supplementing these when required by an ornamented bag (slung at the waist) and a staff, of which the ivory or bony upper part was made in hollow sections to contain pills and other remedies. He now visited his dispensary, where he saw his patients and where he ordered his servants to go and collect medicinal herbs, plants, honey and other medical requisites. He then seated himself on one side of the dispensary near a table where his medical books were arranged, a long line of *Olas*, the valuable treasures of ancient medical science.

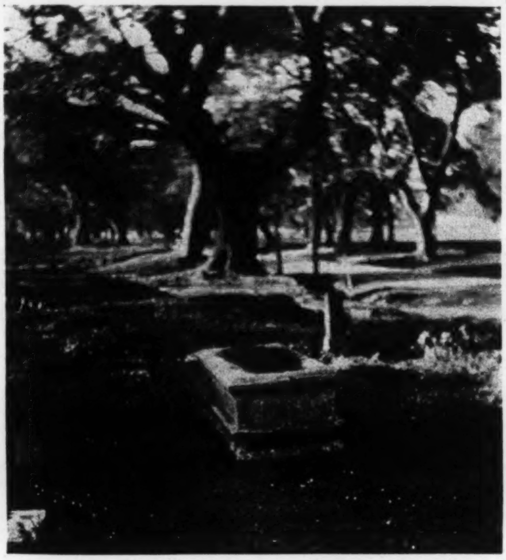
Convenient to his hand for writing purposes were a number of styluses of different shapes and sizes. On the other side of the table was accommodation for the patients and visitors. From 8 A.M. till noon there was an uninterrupted flow of patients and visitors. Entering the dispensary, they made obeisance to him in Oriental fashion and severally presented a *bulath burulla* (betel leaves, generally 40 of them, tied in a bundle) or other presents, according to the patient's position or wealth. Then each one, in order, described minutely his several symptoms and after a careful diagnosis in each case, the Vederala dictated to his pupils (who were seated close to him on lower stools or benches) the prescriptions and directions for the care of the patient. The pupils prepared the former and handed over a copy of the prescription in ola (prepared palm leaf papyrus), together with the prescribed medicines. These latter took the form of decoctions, powders, pills, oils, and so forth. At noon the Vedarala and his pupils dispersed for their breakfast, which consisted, as a rule, of rice and curry. At about 1 P.M., the Vederala again visited his dispensary and examined carefully the several medicinal herbs and plants brought there by his servants, intrusting the sorting and storing of them to his well-trained pupils.

Then he made his professional calls, provided as before with a liberal supply of remedies, either secured in his waistband or suspended from his girdle by means of a bag. Ola leaves, enclosed in a neatly worked wallet, he handed to an attendant pupil. Armed with an elaborately lacquered staff, which served the double purpose of support and medicine container, and after waiting for a lucky omen, he stepped out of the house for his round of duty.

The favorable omen may be one of many, among them a pretty maid bearing a pot of water or a healthy milch cow were sure signs of a successful day. He returned home at 4 P.M. and, after a short rest, he gathered his pupils round him and instructed them in medical science and surgery. He also questioned them as to what they had observed during the day's service in hospital, dispensary and private practice.

Not only must the pupil prove himself an apt student but he must pass a sort of preliminary examination. For twenty centuries it was forbidden by the rules of Ayurvedic medicine to teach that science to (1) those that have no hair on either side of the face; (2) to those that have no hair on the breast; (3) to those who are cruel in their habits; (4) those who bear enmity and hatred in their hearts towards their fellow man; (5) those who are deformed, disfigured or ugly, also those who are feeble in health and strength; (6) those who indulge in bad habits, or are evil minded; and (7) those who are quick-tempered or rough of speech. What better qualifications for a family doctor?

Absent treatment, as a therapeutic measure in emergencies, was well known to the ancient Sinhalese Vederalas. For example, if a person were bitten by a poisonous snake and the doctor could not reach the sufferer at once, the physician intoned certain prescribed verses and incantations which were often efficacious, especially when local and general treatment were also applied by a layman versed in medical lore. The conduct of a case *in absentia* was also resorted to when by reason of distant residence or other inacessibility, it was very difficult for the Vederala to make frequent visits. The modern "scientist" could readily find in Sinhalese medical literature many authenticated cases of the efficacy of this revived therapy.



SINHALESE STONE *Bebetboruwa* OR "CANOE" (7 FT. × 3 FT.), FOR THE TREATMENT OF FRACTURES AND FOR OTHER SURGICAL PURPOSES. FROM A MEDIEVAL SINHALESE HOSPITAL AT ANARADHAPURA. THE INTERIOR OF THE CANOE IS FILLED WITH EARTH TO PREVENT THE BREEDING OF MOSQUITOES.

Surgery, in anything like the modern sense, does not appear to have been practiced by the Vederala. In several of the ruined temples and hospitals is to be seen the *Bebetboruwa* or medical canoe, a stone, coffin-like structure sculptured to fit the recumbent patient. (See the illustration.) One of the functions of this bed was certainly as a table for treating fractures of the long bones, the patient being placed in the "canoe," the injured limb straightened out and further kept in position by applying large leaves and small branches bound to the vicinity of the break by a cloth, thus securing, also, the remedial properties of the plant.

Eye surgery was confined to the use of collyria, the employment of spectacles, and the removal of foreign bodies by means of a copper or other metal spud.

Diseased teeth were removed with forceps. Toothache, *Panuwa-Rala,* was believed to be due to a worm (*Panuwa*).

Abscesses were opened by burning an opening into the sac by means of a specially constructed blade. If the patient could afford it the knife was of gold, the successful surgeon being presented with the instrument after the operation.

Descriptions of major operations, cesarean section, craniectomy, opening of abdominal viscera, and so forth are so clouded with myth that little reliance is to be placed upon them.

The ears were regularly cleaned by means of a "spoon" which was often the other end of the eye spud. Small pliers were used for many minor operations, including the removal of thorns, nasal worms and for epilation of the lids, and so forth. Occasionally these small appliances were made in gold and silver, and elaborately chased and damascened. These decorated instruments were, as a rule, the property of Court Physicians or of Vederalas attached to chief or rich monasteries, and were often the gift of rich patients. The syringe has already been mentioned.

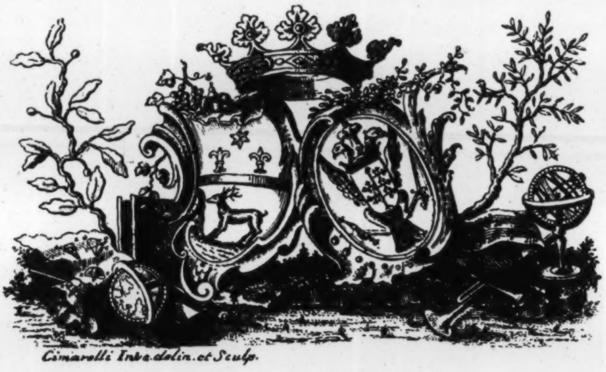
In some parts of the island, for the treatment of milk fever (and to prevent breast abscess) the bark of *Holarebena mitis* was bruised at a convenient spot and the inflamed breast applied to the area from which the latex exudes.

Castration was performed by thrusting needles and thorns beneath the parts, but only as a punishment or in revenge, never as a surgical procedure for the relief of abnormal conditions.

In the Colombo Museum is what looks like a double olive-headed bougie. The copper shaft is five inches long, either end being armed with olivary points much like an old-fashioned metal bougie. The heads are about one-third inch at their greatest diameter.

I was shown, in the shop of a reliable dealer, an evidently very old, thickly woven colored stretcher, about six feet long by nearly three wide, made of native cotton, which, the dealers said, was used by the Vederalas for the transportation of patients to and from hospital. It had a wide hem at either end to accommodate a couple of poles, and was intended to be carried by four men. In visits to distant or uphill villages, the Vederala was carried on this stretcher by his servants.

My thanks are especially due to Dr. Andreas Nell, Judge Paul Pieris, and Messrs. John Still, Frederick Lewis and B. Weerasirie of Kandy, as well as Dr. R. L. Spittel and Mr. A. E. Jayasinha, assistant librarian of the Colombo Museum, for their kindly aid in preparing this paper. Colonel Fielding Garrison of the Surgeon General's Library has been good enough to read the manuscript and correct the proofs as they passed through the press.


Cimarelli Inv.e delin. et Sculp.

[From Redi: Opere. Napoli, 1778.]

[From Erastus: Varia Opuscula Medica. Frankfurt a. M., 1590.]

EDITORIALS

THE ORDER OF THE HOSPITALS

While browsing recently in the oldest medical library in the United States, that of the Pennsylvania Hospital in Philadelphia which was founded in 1763, the writer came across a little book which at once aroused his attention and recalled to his memory that it had been written of by Sir D'Arcy Power. It is entitled:

THE ORDER
OF THE
HOSPITALS OF K. HENRY THE VIIIth
AND KING EDWARD THE VIth,
viz. St. Bartholomew's
Christ's
Bridewell
St. Thomas's
BY THE MAIOR, COMINALTIE, AND CITIZENS OF LONDON, GOVERNOURS OF THE POSSESSIONS, REVENUES AND GOODS OF THE SAYD HOSPITALS
1557

Sir D'Arcy read his account of the book before the Bibliographical Society, March 21, 1921,[1] and as usual gives the most scholarly and complete information concerning his subject in the most delightful manner. He states that there were twelve copies of the book available for comparison. The British Museum and the Bodleian Libraries have each two copies: the Guildhall Library, the Society of Antiquaries, Christ's Hospital, the Pepysian Library at Cambridge, the Medico-Chirurgical Society at Bristol, and the Surgeon-General's Library at Washington have one copy each, as had also Sir William Osler and Sir D'Arcy Power. The Pennsylvania Hospital copy, of course not known to him, adds a thirteenth to the list. The writer has been informed that another copy was recently sold in New York but he has been unable to ascertain by whom it was sold or who was the purchaser.

The Pennsylvania Hospital's copy is identical with that described by Power. It is a duodecimo, printed in black letter without the name of the printer or any indication of the place of publication. It is well bound in brown leather and printed on paper of excellent quality. Some of the copies have no watermark on the paper, and the watermark varies in the copies which contain it. The Pennsylvania Hospital copy has a watermark, a shield bearing a fleur-de-lys with a crown at one end of the shield.

Although the book bears the date 1557, Sir D'Arcy proves conclusively that this is an imposture, and that it really dates from the closing years of the seventeenth century. He discloses the reason why the "Order of the Hospitals" which was first enacted in 1557, came to be printed for the first time nearly one hundred and fifty years later. All of the copies he studied appeared to be part of one issue, which was put into circulation at the end of the seventeenth century. No example of any older edition has been found, and these copies Power proves are examples of what the antiquary Oldys called the Pepys' reprint.

The little book contains the rules by

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[1] Published by the Oxford University Press from the Society's Transactions (*The Library*), 1921.

which the charities mentioned were to be governed. It states how many governors there shall be: how they are to be appointed; their duties; the manner of conducting their courts, or meetings; the duties of the various officers of the institutions and many other similar matters. The order in which the officers are listed is somewhat amusing, as the "Chirurgian" is sandwiched in between the "Shoemaker" and the "Barbour."

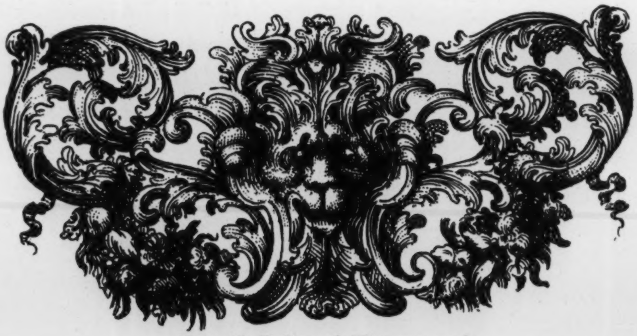
Sir Thomas Offley was the Mayor of London in 1557 and the little book is headed "Offley, Maior." For several reasons, the date of publication on the title page, the Mayor's name correctly given, and the book being printed in black letter, a superficial observer might readily conclude that the book really dated from 1557. But mark how Sir D'Arcy proves that it was not. The foreword headed "Offley, Maior" is signed "Goodfellow." In Strype's edition of Stowe's "Survey of London," published in 1754, he states that the Orders "were printed in a little book in the time of Mr. Goodfellow, Towne Clerk," and in Gough's "British Topography," published in 1780, he mentions "The Order of the Hospitals, etc. since reprinted in the old character and size at the expense of Mr. Secretary Pepys. O." This "O," whom Gough gives as his authority, was William Oldys, the distinguished antiquary. John Goodfellow was town clerk from 1690 to 1700. Power states that the reason for the printing, not reprinting, because heretofore "The Order" had quite certainly only existed in manuscript, was that in 1681 the Court of Aldermen made a determined effort to regain the jurisdiction which they had formerly possessed over the four Royal Hospitals, a jurisdiction which had been allowed to lapse from disuse. This led to several years of discussion. In 1690 the Aldermen finally settled matters to their satisfaction by proving the fact that "The Order" placed the control of the governors of the four hospitals in their hands.

The printing of "The Order of the Hospitals" seems to have been the immediate outcome of this struggle. It must have been necessary for all the governors of the hospitals who took an active interest in them to study the Orders, which had hitherto existed only in manuscript. A new copy was therefore obtained from the Guildhall and its authenticity was guaranteed by the signature of the Town Clerk. It was printed and a sufficient number of copies were struck off for the use of the governors.

A CORRECTION

In the article on Rokitansky by Dr. Frank R. Menne (Annals of Medical History, 1925, vii, p. 379), the quoted paragraph attributed to Dr. F. H. Garrison is, on the author's showing, to be credited to the pathologist Solomon Stricker.

Editor.



[From Redi: Sonetti. Firenze, 1702.]

BOOK REVIEWS

THE ROYAL COLLEGE OF SURGEONS OF EDINBURGH. HISTORICAL NOTES FROM 1505 TO 1905. By Clarendon Hyde Creswell, F.S-A. (Scot.), Late Officer and Sub-Librarian of the College. Privately Printed for the College by Oliver and Boyd, Edinburgh, 1926.

A melancholy interest attaches to this work, the material for which was collected and a portion published in the *Edinburgh Medical Journal,* when its Author died while serving in the army in October, 1918. The President's Council of the College subsequently prepared the work for publication in book form.

In 1504 the Kirkmaster of the Barber Craft of Edinburgh obtained the right to hold service at an altar in the Kirk of St. Giles at Edinburgh, and Creswell adduces proof to show that the surgeons of the town were members of the Barber Craft. In 1505 the Town Council formally incorporated the barber-surgeons as one of the Crafts of the Burgh and thenceforth they began to take a prominent part in the municipal activities of Edinburgh. Creswell gives many most interesting extracts from the Minutes of the Craft throwing much light on the social as well as medical customs of the time. At first it would seem that all the members of the Craft were practicing or expected at some time to practice surgery as well as serve as barbers, but in 1588 it is clear that there were two distinct classes in the Craft, those who practiced surgery and those who were content to remain simply barbers. About 1650 the Craft began to admit apothecaries and by the latter part of the seventeenth century these surgeon-apothecaries had entirely replaced the barber-surgeons of the old Craft, the members of which no longer condescended to practice the tonsorial art. The barbers were still under the control of the surgeons but though admitted to practice their calling on payment of a fee to the Craft they were prohibited from practicing any kind of surgery. The same internecine warfare prevailed between the barbers, the surgeons, the apothecaries and the physicians in Edinburgh as elsewhere and many pages record the various procedures they adopted from time to time against one another. The College of Physicians of Edinburgh was incorporated in 1681, and the Surgeon's Craft fought bitterly but in vain against it. In 1694 the Surgeon's Craft obtained a new charter by which the apothecaries were united with them. In 1728 the barbers were finally separated from the surgeons and the latter deprived of all control over them. An interesting account of certain festive occasions such as the dinner that the apprentices were required to give when they were admitted as master-surgeons, and the annual dinners given by the Calling, as the Craft of the Surgeons came to be known, to the magistrates of the city. All the various requirements for the diploma, changed from time to time, are duly given. A most delightful chapter is that on the teaching of anatomy by the members of the College. So much has been written by Comrie and others on this perennially interesting subject that it is curious to find anything new could be unearthed, yet Creswell gives us some original matter. The association of the College of Surgeons with the Royal Infirmary is described at length and there is a good chapter on the professors of surgery of the College. Chronicles such as this are of great interest as well as of historical value. Young's splendid volume of "Annals of the Barber-Surgeons of London," and South and D'Arcy Power's "Memorials of the Craft of Surgery" have given us a wealth of information on the history of surgery in England. Creswell's volume is a worthy supplement to these works and should occupy a place beside them.

FRANCIS R. PACKARD.

THE PRINCIPLES OF ANATOMIC ILLUSTRATION BEFORE VESALIUS, AN INQUIRY INTO THE RATIONALE OF ARTISTIC ANATOMY. By Fielding H. Garrison, A.B, M.D. New York, Paul B. Hoeber, Inc., 1926.

The Author states in his preface that the intention of his work is philosophical rather than historical, and his performance of his task certainly fulfils his intention. There are many books dealing with the historical aspects of medical illustration, and much has been written on the pictures drawn by prehistoric man and on the sculptured remains of antiquity as they bear on anatomical form. In a short list of matter for collateral reading Garrison gives references to some of these. None of them carries out the idea of the delightful little book which is the subject of our review. Garrison points out that there were two distinct principles underlying all pre-Vesalian illustration: First servile adherence to tradition manifested in faulty rudimentary delineation, which prevailed with few exceptions down to Leonardo da Vinci. Second, there remain many admirable drawings, paintings and sculptures manifesting first-hand observation on the part of the artist, whether he were prehistoric or primitive, throughout the period down to and including the epoch of Leonardo. Garrison describes the earliest known figure representing a human being, the so-called "Willendorf Venus," a limestone statuette found in deposits of the Aurignacian period (40,000–16,000 B.C.). The huge breasts and buttocks characteristic of primitive woman are wonderfully portrayed. "The depositions of fat were probably due, as Osborn surmises, to a diet rich in fat and bone-marrow, and to the sedentary life and confinement of women to caves in the glacial period. . . . In any case, this figure conveys all that is known of the physiological habitus and metabolism of prehistoric women, while the general obesity and lipomatosis of the buttocks tend toward the pathological." Garrison shows a picture of this statuette accompanied by those of other prehistoric statues all showing the same physical conformation. On the other hand all depictions of the male figure by prehistoric artists show the broad shoulders, straight flanks, narrow hips and hard muscles of the athlete. There is a marked parallelism between these prehistoric works of art and the artistic productions of the Esquimaux, the Bushmen of South Africa, and the Indians of North America. Prehistoric and primitive art is usually animistic, tending to portray action and movement rather than aiming at perfection of form: "In this regard such art bears a striking resemblance to the drawings, paintings and carvings of the insane." Garrison reproduces pictures of achondroplasic figures, etc., showing that the content of primitive sculpture was frequently pathological. He considers how the beautiful statuary which was developed in Egypt and Greece arose in very primitive form, and quotes as an instance of the keenness of the sculptor the figure of the Amazonian warrior on the Parthenon in which the pectineus muscle in Scarpa's triangle is thrown into relief although in life it is not visible in repose, "a striking example of the Greek sculptor's power to record what he actually saw, even when the structure was unknown to him as such." When we think of the difference between the work of the ancient artists and the pictures which were used as anatomical illustrations from the time of Galen to Vesalius, it is difficult to account for such a terrible lapse. What Sudhoff called the "Five Picture Series" are five schematic diagrams which prevailed in China, Japan, Persia, Yucatan and all Western Europe. Garrison reproduces some examples. They show the muscles, nerves, bones and blood vessels and sometimes the generative organs. These crude outlines are always represented with the body in a peculiar squatting attitude like that of the reflex frog of the laboratory. "The stereotyped attitude, gazing rigidly forward, as in all Egyptian and early Greek sculpture, points, as Sudhoff surmises, to Hellenic, eventually Alexandrian provenance." These pictures, of course, made no pretense at accurate representation of the structures. They were merely intended as memory helps. It is not until the early fourteenth century that anatomical illustrations begin to show any indications of being the result of actual dissection. "The five-lobed liver, seven-segmented sternum, horned uterus, bolt upright fetus, faulty tilt of the spine and pelvis and other errors of traditional anatomy were not corrected in the manuscript hand drawings until the advent of Leonardo da Vinci."

Garrison goes into the details of the relations existing between the artists and the apothecaries and physicians in Florence. He quotes Streeter's remarkable studies which have thrown so much light on the heretofore mysterious reason why the artists in the fifteenth century in Italy manifested so great a knowledge of anatomy. The first artist to take up the scientific study of anatomy was Donatello, and from his time the great Italian artists down to Leonardo da Vinci all put forth the most remarkably accurate anatomical illustrations. Leonardo da Vinci, as Garrison states, "was the founder of artistic (morphological) and physiological anatomy." He was the forerunner who paved the way for Vesalius. Garrison points out how infinitely superior, not only in execution but in anatomical correctness, the drawings of Leonardo are over those of Calcar, the artist of the "Fabrica" and sums up some of the contributions made to anatomy by Leonardo which unfortunately were unknown to the world because never published until many generations after Leonardo's death.

It is needless to say that this little book is of the greatest value. The brief summary given above of its contents superficially indicates its scope. It not only exhibits the erudition of the Author but also his wonderful ability to give philosophical interest to what might too easily appear as a dry record of facts. Charmingly written and amply illustrated it is a delightful work.

Francis R. Packard

Les Curiosités de la Médecine. ii. Les Cinq Sens, Par Docteur Cabanés. Librairie E. Le François, Paris, 1926.

The first volume of this new series of books, "The Curiosities of Medicine," by Dr. Cabanés has already been the subject of review in the Annals. In the general plan of the proposed series this is the second volume. In it the Author in his inimitable manner recounts all kinds of strange matters connected with the various sense organs. Many curious ethnological or esthetic customs are related, and there is much folklore to be gleaned from the mass of facts which the learned writer has collected. The chapter on the nose is particularly interesting in this respect. The reader who is seeking information on pathological anomalies will be somewhat disappointed, but he who reads for diversion will be pleasantly amused. Thus we find among the topics discussed the question whether a large nose is indicative of brain power or genius, and the names of many great persons are arrayed as testimonials in favor of a large nose. The relation of sense of smell to sexual manifestations is very fully discussed. Under Sight, the Author discusses whether the image of the last optic picture is retained on the retina after death; the "evil eye," the origin of spectacles and many other topics. In his discursiveness and manner of presenting his subject matter the Author recalls that old treasure house of professional stories, "Professional Anecdotes or Ana of Medical Literature," which was published at London in 1825. In other words Dr. Cabanés has written a bright little book wherewith to amuse the leisure hours of the physician and furnish him with stories which he may retail with gusto to his patients and colleagues.

Francis R. Packard.

Les Curiosités de la Médecene. Les Fonctions de la Vie. Par Docteur Cabanés. Librairie E. Le François, Paris, 1926.

This is the third volume in the series of "Les Curiosités de la Médecine" by Dr. Cabanés, the distinguished writer of so many works dealing with medicine in its relation to history. Under the five headings of the digestive, respiratory, circulatory, urinary and nervous systems, the Author relates much information concerning their anomalies, popular errors or superstitions connected with them and their functions, and many curious anecdotes in which they figure. He gives much detail on various maladies with which historical characters have suffered; e.g. Luther, Napoleon, and Montaigne from stone in the bladder. A long and interesting section deals with the preservation of the hearts of various eminent personages: kings and queens of France, Duguesclin, Mazarin, etc. Most readers are familiar with the story that when the famous Dean Buckland, the naturalist, was shown the heart of Louis xiv, he astonished and horrified the onlookers by suddenly putting the precious relic in his mouth and swallowing it. Fortunately Cabanés justly considers the story as of very doubtful veracity. A great deal of space is devoted to the references in literature to the various organs, the liver as the seat of the passion of love, the spleen of anger, etc.

The book is a very interesting collection of anecdotes and relations of anomalies and is evidently intended for the lay as well as professional reader. It is to be regretted that in many instances no exact reference is given to the source of the material.

Francis R. Packard.

THE PEAKS OF MEDICAL HISTORY, AN OUTLINE OF THE EVOLUTION OF MEDICINE FOR THE USE OF MEDICAL STUDENTS AND PRACTITIONERS. By Charles L. Dana, A.M., M.D., LL.D., Professor of Nervous Diseases, Cornell University Medical College, Late President of the New York Academy of Medicine, etc. Paul B. Hoeber, Inc., New York, 1926.

Dr. Dana begins his book with a page on which are diagrammatically presented the six "peaks" which he considers as the landmarks in the history of medicine from its beginning to the present day. At the summit of the first Peak he places Hippocrates; the second is marked by the development of the Alexandrian School; Galen tops the third and incidentally the longest, lasting from his death two hundred years after the commencement of the Christian era until the Renaissance, which marks the fourth Peak. The fifth and sixth Peaks are crowned respectively with the names of Harvey and Jenner, the latter opening the present era. Although the history of medicine covers a period of some four thousand years it is only during the last four hundred that it is marked by real continuous scientific progress. Dr. Dana states that the two chief factors which retarded medicine for so many centuries were the ancient prejudice against dissection, and "the method of Aristotle, which loftily aimed to turn medicine into philosophy, and thus became its bane." The three sections covering the Hippocratic, Alexandrian and Galenical periods contain the most concise and one of the best expositions of ancient medical history which we have ever read. The leading ideas of the various schools, the Empirics, the Methodists, etc., and the contributions of the Arabians are briefly mentioned and analyzed. The chief authors and the character of their writings are admirably summed up and what is usually an arid record of names becomes in Dr. Dana's hands a vivid series of thumbnail sketches calculated to impress the mind and remain in the memory of the reader. The first two centuries in the period of the Renaissance are termed the erudite. They were marked by the tremendous interest in the study of Greek, brought about by the capture of Constantinople and the consequent spread of Grecian scholarship throughout Europe. As Dana says, although scientific medicine made little progress because of the slavish submission of the learned to Greek traditions and authority two great steps towards the future development of the science were made. The first was a great increase in the number of universities and schools, and the second was the attention paid to the study of anatomy. The great universities of Montpellier, Bologna and Paris grew enormously in size and importance. In 1315, at Bologna, Mondino had publicly dissected a human body and from that time on there was a continuous increase in the interest in anatomical study throughout Italy. Dana outlines the work of the five great masters of anatomy who illuminated the sixteenth century: Sylvius, Vesalius, Fallopius, Fabricius and Eustachius. The most prominent name in clinical medicine in the sixteenth century was that of Fernel, professor at Paris. He was the great exponent of orthodox or classical medicine which received its deathblow from Paracelsus. Guy de Chauliac was the authority in surgery during the fourteenth, fifteenth and the first half of the sixteenth century, until Paré transformed surgery and established it as a science. The seventeenth century was marked by Harvey's physiology. Van Helmont founded the so-called chemical school of medicine while Sanctorius and Borelli originated the mechanical school. Neither they nor their followers did as much for real medical progress as Thomas Sydenham, the greatest clinical observer since Hippocrates. Dana runs through the names and achievements of the other workers in the various branches of medicine who were gradually but surely adding stones to the growing structure of scientific medicine. At the summit of the last Peak we find the name of Edward Jenner. With him we enter upon the period of modern medicine, of the history of which, during the past century, Dana gives us a bird's-eye view. A short but valuable appendix of bibliographical notes concludes the book.

Although such a work as Dr. Dana's is particularly valuable to the medical student or practitioner who wishes a guide to lead him in his efforts towards the study of medical history, we feel that it will prove of the greatest help to more advanced workers in the field. Dr. Dana, while covering the entire subject, from the earliest times to the present day, has the happy faculty of extracting the wheat from the chaff in such a way that all that is worth while can be easily grasped. At the same time he gives just enough space to what we might term the side issues to indicate their existence to the reader and point out collateral matter which he may follow up if he wishes. Dr. Dana states that he has chosen as illustrations for the book pictures which he considers as kinetic rather than static; in other words, although there are portraits of many of the great leaders of medical science, the bulk of the illustrations indicate medical activities, such as hospitals, colleges, etc., or show the conditions under which the doctor pursued his calling. This feature of the book is especially pleasing, and with its beautiful typography adds greatly to the readers' pleasure in its perusal. Dr. Dana's reputation as a classical scholar is well sustained by the delightful touches of erudition which illuminate and add human interest to the pages of this most charming little volume.

Francis R. Packard.

Il Volto di Hippocrate, istorie di medici e medicine d'altri tempi. By Arturo Castiglione. Società Editrice Unitas, Milan, 1925.

Dr. Castiglione has written a series of most interesting articles on various phases of medical history which form a very valuable contribution to the subject. Those dealing with his fellow-countrymen, Leonardo da Vinci, Benvenuto Cellini and Baglivi are especially interesting to those of us who are not Italians. Although most of us are familiar with Cellini's autobiography it is surprising to find how much of great professional interest and importance has been extracted from it by a learned physician of the same race. A most interesting contribution is that dealing with early medical journalism, beginning with the *Gazette* of Dr. Theophraste Renaudot, which was, of course, not a medical journal though published by a doctor of medicine, and continuing with an account of the earliest efforts at medical journalism in France, England, Germany and Italy. There are many excellent facsimiles of these early journals and the description of their contents is very entertaining.

In Italy, as elsewhere, there has been a great revival of interest in the history of medicine in recent years, and in no country is there a more ready access to original sources. Dr. Castiglione shows himself a worthy compeer of the many excellent Italians who have availed themselves of the great opportunities at their hands. His book is beautifully illustrated with a large number of interesting pictures, many of them not hitherto familiar to us in America; in particular there are some figures of apothecaries' vases of the fourteenth and fifteenth centuries.

Francis R. Packard.

Cum INDICE locupletiſsimo.

[From Franciscus Vallesius: Hippocrates. Coloniae, 1589.]

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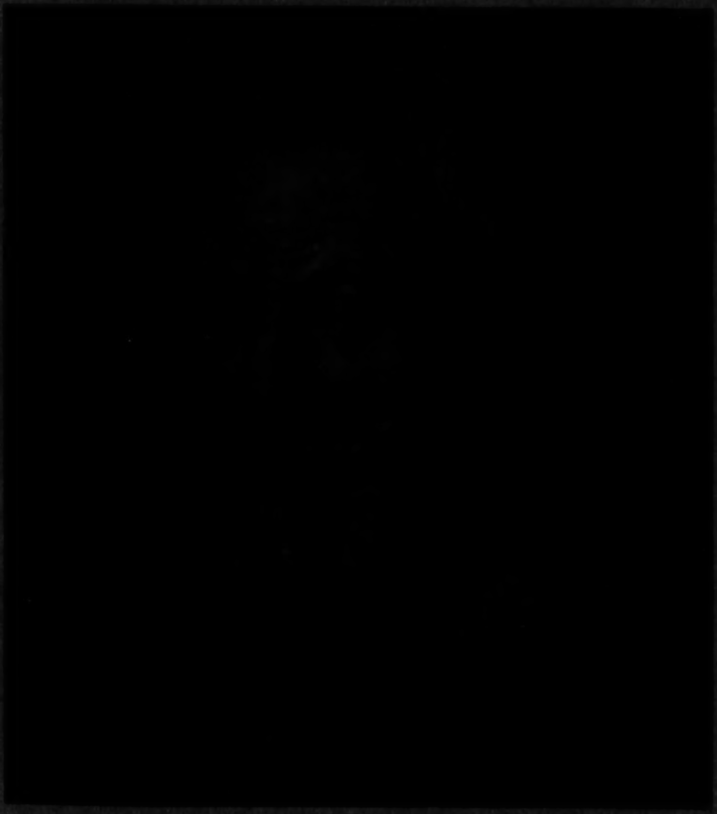

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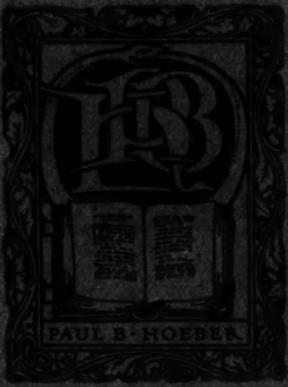
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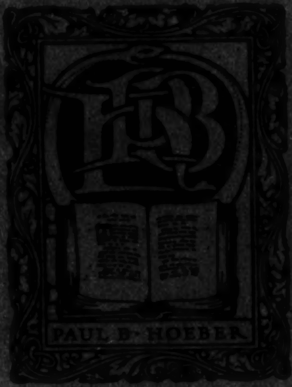
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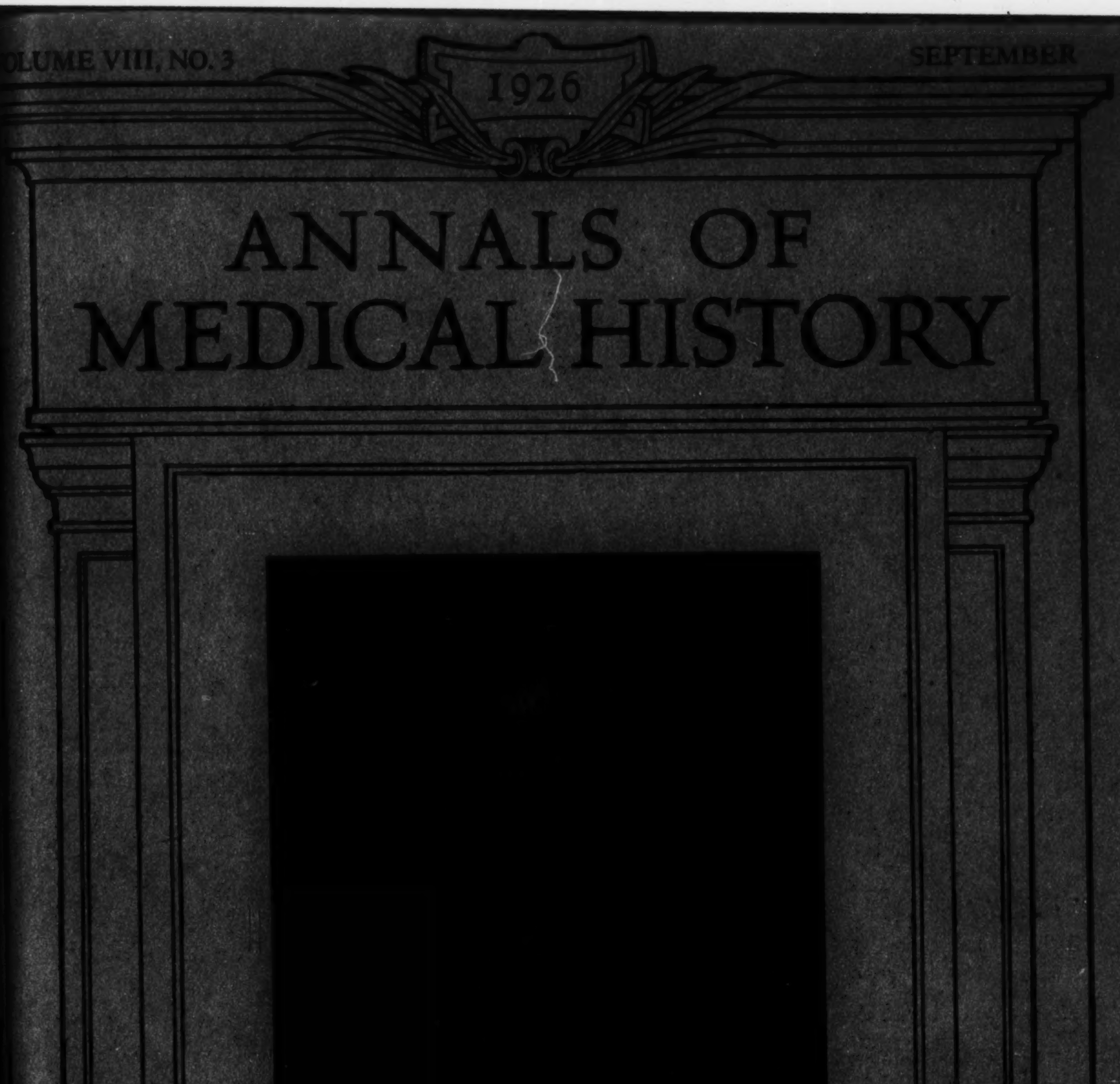

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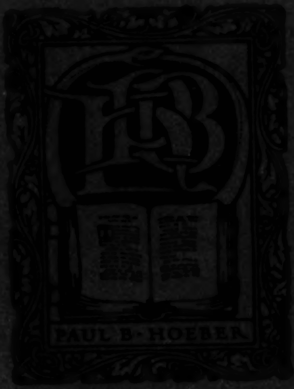
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